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08 Networking Tips & Tricks

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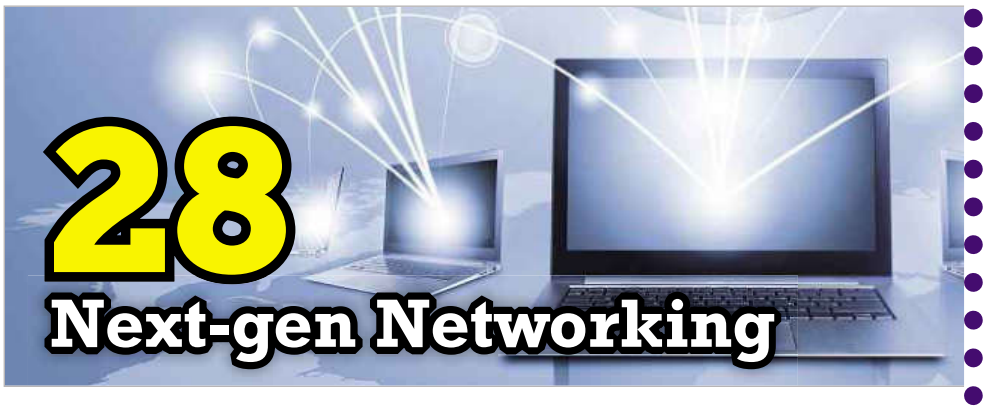
26 Networking Standards Explained



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28 Next-gen Networking

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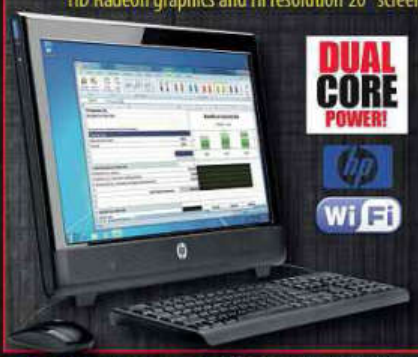

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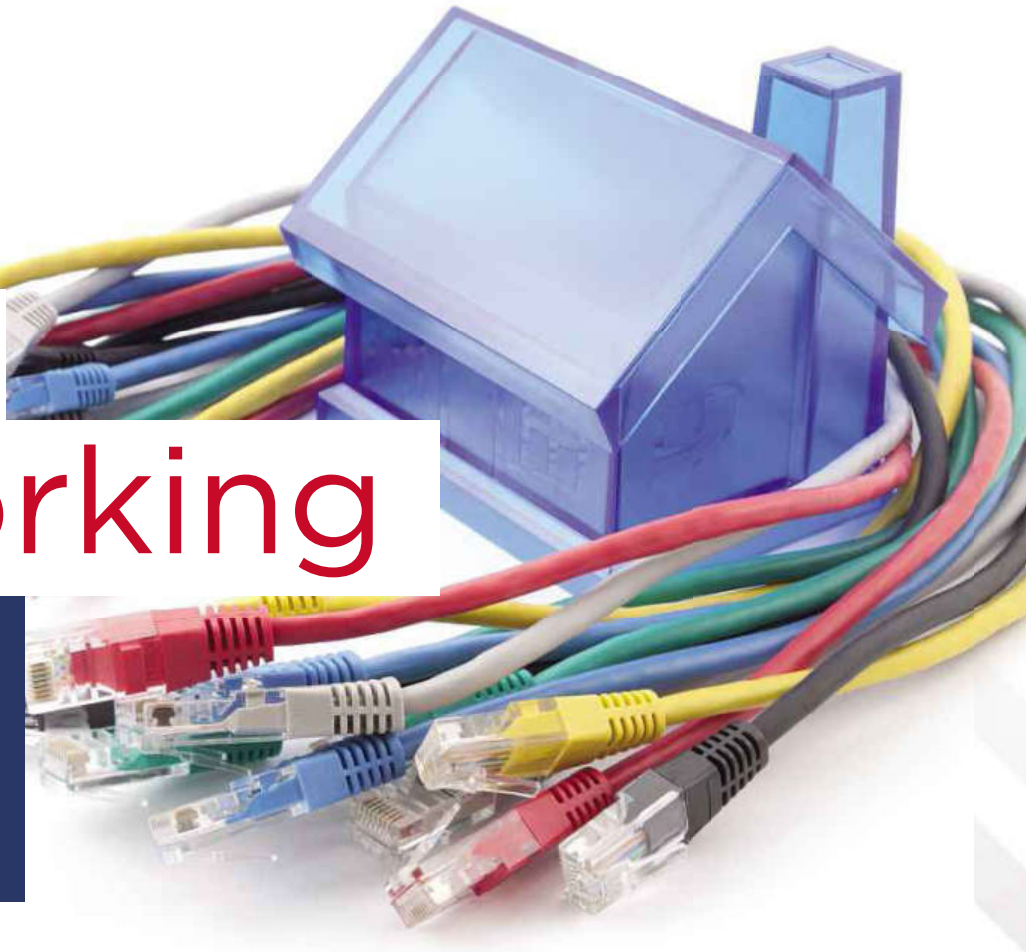
Home Networking

Tips & Tricks



If you want more speed or reliability, give these tricks a try

Getting your network to perform brilliantly is as much an art as a science. Getting it working isn't the same as getting it working well, and making the leap from the former to the latter can mean you have to apply years of experience and understanding.

But in case you don't have years to learn, we've compiled this list of our essential home networking tips and tricks. Whether you're a novice or an expert, there's something you can do to help your hardware along, and hopefully it's in this list.

1 Put Your Router In Its Place

And we mean that literally. If your hardware was installed by your ISP's visiting engineer, then it's likely that they left it close to the location where your data connection enters the house. That might be near the phone line's master test socket or a cable box, but it's usually on the ground floor and probably near an exterior wall. That's a good place to install a router if you're an engineer trying to get in and out of someone's house as quickly as possible, but if you're using a wireless signal, that's almost never the best place for you to actually connect to it on a daily basis.

The distance between your wireless device and the router can have a significant effect on speed, reliability and even security. To get the best speed and coverage out of your network, you have to minimise it. For most people, that means putting your

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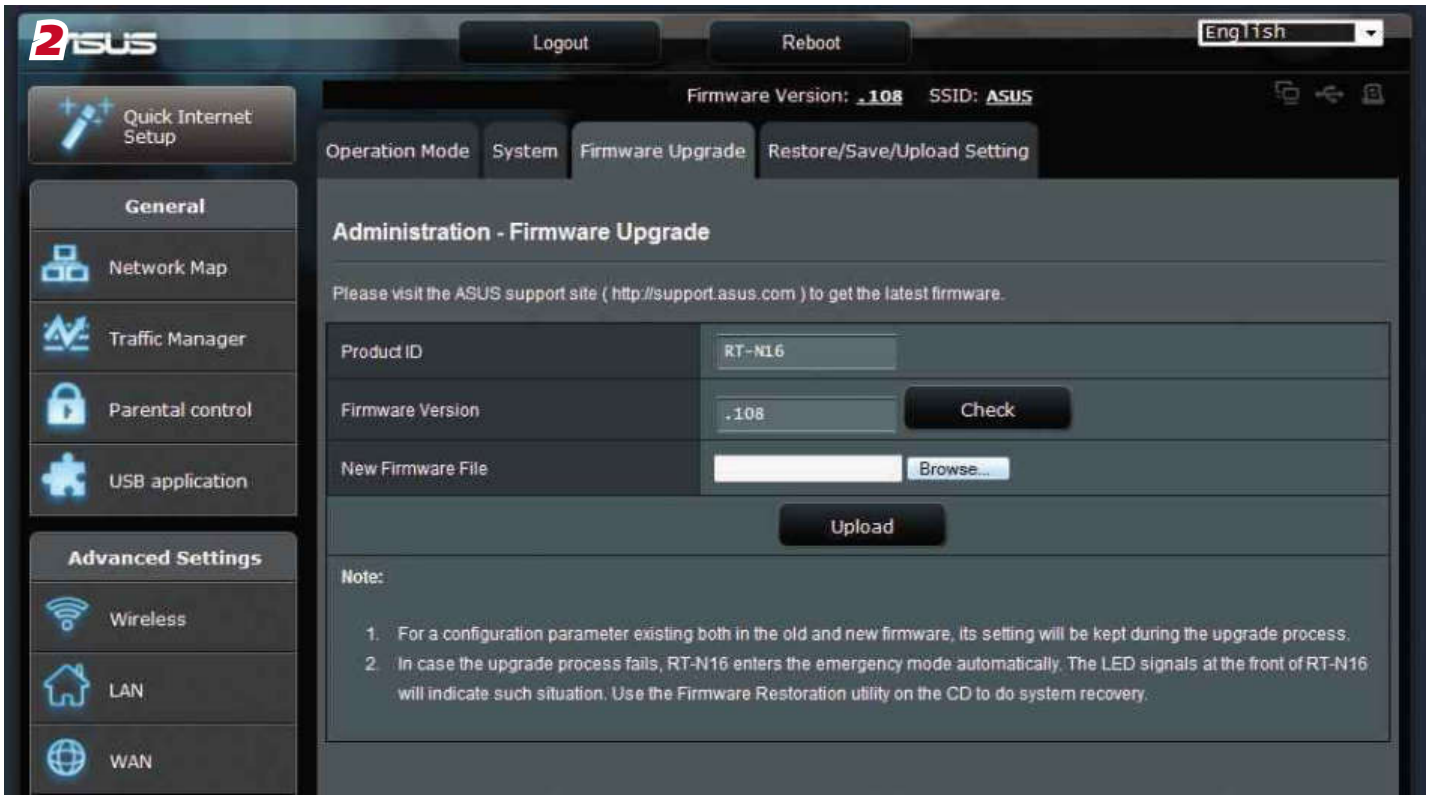

router somewhere towards the middle of the house and in the most central location possible. Experiment and see what works for you!

2 Upgrade Your Router's Firmware

Installing new firmware on a router can be an irritating process, not least because it might wipe out custom settings you've carefully tweaked to perfection over years of use. But new firmware can add new features, iron out bugs and improve compatibility, all of which can contribute to a more robust network signal. In some ways, upgrading the firmware makes old routers feel like new.

Firmware downloads are normally available from the manufacturer's website, and updating the router is a fairly simple process which can be accomplished from the system's administration backend.

If you're feeling particularly adventurous, you could try replacing your router's firmware with a free, open-source alternative called DD-WRT. Available from **www.dd-wrt.com**, the firmware adds a number of features and greater controls not found in most router software. It's not for novice users (improper application could turn your router into little more than a decorative brick), but if you think you have an old router around that might benefit from the more advanced software, it could prove a fun experiment!

“Installing new firmware can be an irritating process, not least because it might wipe out custom settings”

3 Reduce Wireless Interference By Swapping Wi-fi Channels

As wireless networking has become more and more popular, the chance of someone else's wireless network causing interference has grown too. Interference is caused when two or more networks using the same broadcast channel 'overlap'.

Overlaps of any kind can cause signal interference, and if two nearby access points are running on similar channels, they'll detect traffic meant for the other network as well as their own, causing congestion.

Changing the channel can fix this problem. The number of the channels in use depends on the network protocol and band, but the important thing to note is that 2.4GHz networks (Wireless G and N) only have three non-overlapping channels – 1, 6 and 11 – while 5GHz networks (Wireless N and AC) have channels that are pre-defined with no overlap. If you think you're getting interference from someone else's network, switch your 2.4GHz network to channel 1, 6 or 11, or switch your 5GHz network to any other available channel. If the problem is indeed that someone else nearby is using the same channel as you, this will eliminate all interference and restore your network's full speed.

4 Increase Wireless Speed And Reliability With High-Gain Or Directional Antennas

The antennas most routers and wireless adaptors come with are called omnidirectional antennas which, as the name suggests, means they give coverage that's roughly the same in every direction. This is convenient, but it's also quite wasteful, and it creates a weak signal. By comparison, directional or high-gain antennas give a stronger, more focussed signal, and you can use them with many different types of hardware.

Most wireless access points and adaptors allow you to replace the antenna pretty easily: you simply unscrew it at the base, then screw the new one in its place. By installing a high-gain antenna that focuses the signal in one direction, you can substantially increase the power of your wi-fi signal without having to move your router. It doesn't use any more power than the omnidirectional antennas;

4

rather, it focuses that power on a single bearing to make more efficient use of it.

The gains can be substantial. Just don't get confused if it takes a little trial and error to find the best orientation!

5 Use Crossover Cable For Simple Connections

With wireless networks, it's no more difficult to connect two computers that are at opposite ends of the house than it is to connect two computers that are right next to one another. But that's not true of wired networks. Even if your desktop systems are in the same room, you still have to run a cable from each system to the router and back, which creates a lot of physical redundancy.

You can get around this using something called 'crossover' cable. Crossover Ethernet cable allows two network adapters to connect directly to one another – something you can't do with standard 'patch' cable – meaning you can bypass the need to connect to a router or other type of network hub. This allows for fast and direct file transfers, and if one system is connected to a modem, you can also use it to share an internet connection.

You can also use crossover cable to unlock an extra Ethernet port on your router. If your hub or router is a standard four-port design and you have a fifth PC to connect, you can use crossover cable to connect a regular PC to the 'uplink' port on a router usually reserved for attaching external modems. Certainly a cheaper solution than buying a second router if you're only one port short!

6 Switch To Gigabit Ethernet For Faster Networking

Most modern routers, network cards and motherboards incorporate support for gigabit Ethernet, which runs ten times faster than the previous (and still common) wired standard, Fast Ethernet, and is usually both more reliable and faster than even a Wireless AC connection. If you have any hardware that supports gigabit connections and you aren't using it, then good news: it's not that expensive to improve your hardware so you can take advantage of these higher speeds.

Before you do that, though, you need to make sure your cabling is up to the job. There are two main types of Ethernet cable: CAT 5 and CAT 5e. The former is rated for standard Ethernet and Fast Ethernet connections (10Mbps or 100Mbps respectively), but only the latter can get the full speed out of gigabit Ethernet.

And it's not just for speed freaks either. CAT 5e cable also has other advantages that make it more likely to provide a stable and reliable connection. Improvements over vanilla CAT 5 cable means that CAT 5e incorporates greater resistance to device interference, reduced 'cross talk' emissions, and improved durability thanks to better standards for its PVC coating. CAT 5e is also backwards compatible with Ethernet and Fast Ethernet, so regardless of what speed network you're running, it makes sense to ensure you're

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using CAT 5e – even if that means replacing existing CAT 5 cables.

7 Expand Your Network With A Wireless Repeater

If you've ever had to use a signal booster to clear up a weak TV signal, you should be able to grasp what a wireless repeater does. And even if you haven't, the name should provide a fairly big clue!

Wireless repeaters are essentially extensions of your access point, which increase the network's effective coverage, increasing speeds and reliability in the most distant hardware. The repeater doesn't do anything complicated – it simply rebroadcasts whatever signals it receives, extending the range with only a slightly increase in signal latency as the cost. In theory, once it's up and running, you'll never have to touch it again.

If you have a spare router lying around, you might not even have to pay for a repeater. Some routers are able to operate in repeater mode with only a few software tweaks, so before you shell out for a repeater, dust off your old hardware, look up the manual online, and see if repeater functionality is included. It could come in handy!

8 Minimise Cable Length To Improve Wired Connections

If you're laying network cable around your home or office, there are probably numerous electrical items around that might interfere with the signal, decreasing speeds and reliability. Anything that generates a strong electromagnetic field has the potential to be a problem, from stereo speakers to fluorescent lightbulbs to microwave ovens.

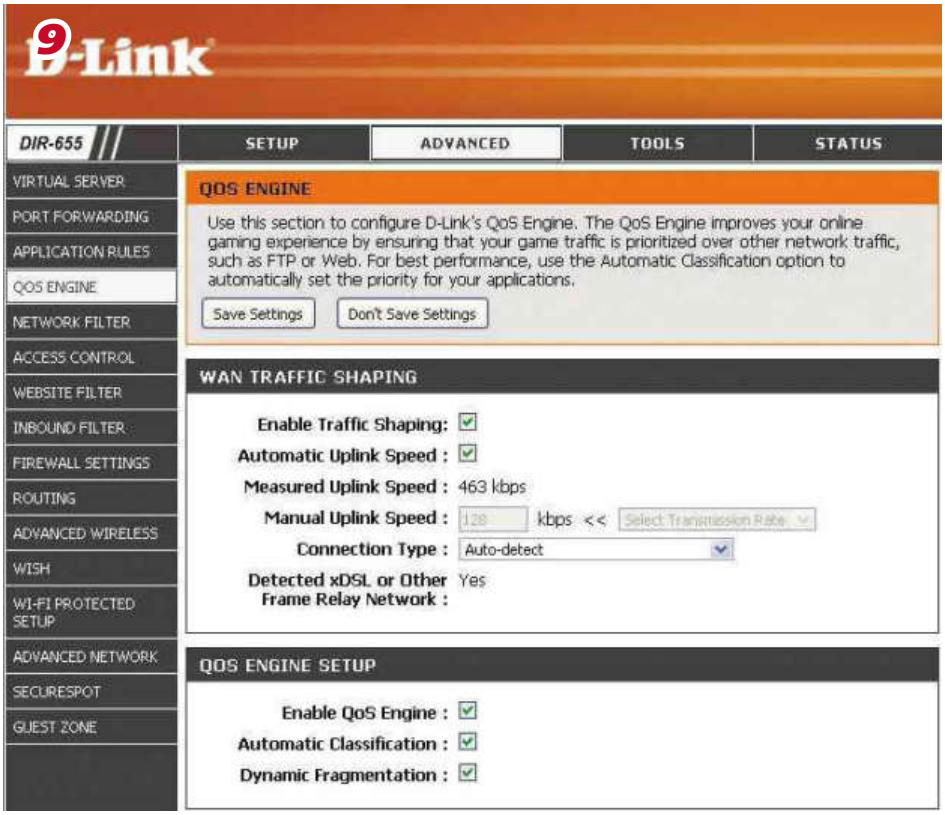
Even hardware designed to handle network traffic can slow down and degrade a signal. It's not usually a huge issue in home networks, but if you're running a larger system with multiple switches and routers, remember to keeps cables as far away from one another as possible to minimise their electrical interaction and to arrange the network so connections visit as few hubs as possible. The more hubs a signal passes through, the more time it takes to reach its destination.

9 Use Your QoS Settings To Manage Traffic

QoS stands for 'Quality of Service', and while it might sound like a fancy name for a customer feedback form, it actually allows you to tweak the priorities of various kinds of traffic that your router is handling. In a practical sense, it means you can make your router do things like treat game data as more important than web data to minimise latency or keep your Skype connection strong even if that means slowing your downloads.

Some routers come with a selection of predefined QoS settings available for you to choose, meaning you can manually enable and disable them depending on your preference without any further work. Other routers will force you to find the information you need yourself and enter it manually, but don't worry, it's not a particularly difficult thing to do. Normally, you just have to find out what port (or port range) the traffic you want to shape is using (i.e. HTTP traffic is port 80) and assign it a name.

In some cases you can also add the MAC address of your computer, smartphone or other network adapter to ensure your system gets additional priority over the rest of the network. It's not foolproof, but with a bit of tweaking you can normally improve performance on busy connections without too much effort required.



> **"Even hardware designed to handle network traffic can slow down and degrade a signal"**

10 Reconfigure Wireless Channel Bandwidth For Greater Reliability

Even if you're not experiencing interference on a wireless connection, you can still improve performance by tweaking your channel settings. Most routers default to using a relatively narrow band covering each channel – just 20MHz wide – to minimise overlap with other devices on nearby channels. But Wireless N and AC both support bandwidths of double that amount. Try setting your router's bandwidth to 40MHz and see if it makes a difference.

In theory, using a wider bandwidth will give you greater reliability and speed, but at the cost of introducing a greater possibility for interference with other networks. Still, it's worth a go, especially if you're in a remote area. At best it'll make your network stronger and faster, and at worst it'll cause a little interference, which is easily corrected by moving back to the 20MHz bandwidth – so it's not like there's a lot at stake if things don't work out! **mm**

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Wireless AC Routers Guide

Which little box of tricks should be part of your setup?

To take advantage of the fastest wireless speeds, you need a router that can handle them. That means upgrading from your old Wireless N or Wireless G models and getting one capable of full-speed Wireless AC.

But whether you're upgrading an existing network or setting one up from scratch, a new router can represent a fairly large amount of money. It's a daily necessity for most people and will undoubtedly be worth the expense over time, but that makes it even more important to buy the right one.

Whatever your situation, it makes sense at this point for the next wireless router you buy to have Wireless AC compatibility. Support for Wireless AC has already been added to many successful product lines, from Apple smartphones and tablets to high-end Ultrabooks and gaming PCs, and it'll probably soon phase out Wireless N entirely in consumer electronics, if it can't already be said to have done that. Wireless AC speeds start at 433Mbps and, in practical terms, top out at a rather satisfyingly fast 3.2Gbps – a tempting prospect, for sure.

Of course, a Wireless AC network starts with a Wireless AC router. So what should a good Wireless AC router look like? What features should you be watching out for? And what, if anything, do you need to avoid? In this guide, we'll examine a range of devices to help you answer those questions and more.

Best Budget Router: TP-Link Archer C20i (£35)

This low-price Wireless AC router saves money in two main ways: it doesn't have a built-in modem (you have to connect it to an existing modem or router using the uplink port), and it only has Fast Ethernet, rather than gigabit Ethernet. As concessions go, neither is particularly crippling, but it does mean it's firmly a budget model and more compromise than bargain. Yes, the cost is what makes it attractive, but that's not to say it's a complete turkey either.

Indeed, the Archer C20i is pretty solid for a sub-£40 Wireless AC750 router, especially since it was pretty much the first one ever. It has dual-band 802.11ac rated at speeds up to 750Mbps. While you don't get some of the high-end features seen in the other (and crucially, more expensive) Archer models, you do get a USB port, which allows you to share storage and printers over the network through built-in software. It's an incredibly useful feature and a genuine rarity on entry-level wireless routers.

Although TP-Link's hardware is sometimes a bit too basic and flimsy feeling, the C20i is one of its more solid releases. The upright form factor hides three internal antennas for stable, omnidirectional connectivity, and the software is made to meet modern needs – a guest network allows you to easily share your connection with visitors, while built-in parental controls allow you to restrict access and bandwidth by IP. At this price, it's hard to overlook it.

Best Budget Router (with Modem): TP-Link Archer D2 (£70)

Cut from a similar cloth as the Archer C20i, TP-Link's Archer D2 gives a slightly better experience for anyone who wants to skip the hassle of connecting their router to a separate modem by containing an integrated ADSL modem, allowing all-in-one functionality and keeping the WAN port free for other uses, whether that's as a spare LAN port or for some other networked device.

The extra hardware does double the cost, but then the modem isn't the only thing you get out of the bargain. As well as an AC750 wireless connection, the Archer D2 incorporates gigabit Ethernet for faster wired connections too. It's worth noting that while it contains four Ethernet ports, that's four total – three gigabit LAN and one gigabit LAN/WAN port, whereas more expensive or wired-only models usually incorporate four LAN and one WAN. It's not a huge loss, especially given the price, but it's unusual enough to be worth pointing out.

As with the C20i, you also get a multifunctional USB port in the bargain, and although it's only USB 2.0, we wouldn't expect any significant slowdown from using it over a network. Built-in software allows you to share printers, media and other files over your network or through a built-in FTP server if you're accessing it from outside your home. Security and networking features include a guest network, parental controls, and IP-based bandwidth restrictions. With prices coming in at just £70, we can't help thinking there must be a catch somewhere. Let us know if you find one.

Best All-Round Router: Asus RT-AC55U (£70)

Another modem-less router, the Asus RT-AC55U comes from a long line of quality routers by Asus, and at the low end of the market it's outperforming the competition significantly. More than enough to justify the £20-£30 it costs compared to other modem-free wireless AC routers? We think so.

A dual-band AC1200 router, the RT-AC55U is great for bandwidth-intensive use, such a media streaming, and has Smart QoS functions that let it prioritise traffic and bandwidth allocation for your preferred use, be that online gaming, file downloads or VoIP streaming. A traffic monitor helps you keep track of your data usage, and Asus's proprietary AiRadar technology combines beamforming, power amplification and RF fine-tuning to keep coverage, data speed and connectivity stable.

If you like your router to give a little extra, this model also gives you access to Asus AiCloud, an online storage service with iOS and Android native apps and a web interface accessible from any web-capable device. Router-to-router sync allows you to instantly share files between supported devices as long as they're both on the internet, so transferring files between friends and colleagues couldn't be easier. Of course, there's offline storage too, with built-in USB 3.0 and USB 2.0 ports allowing you to share two devices simultaneously.

And as if all that wasn't enough, this router can be configured at a single click to work as a media bridge or access point, giving you three devices in one. We can see almost nothing wrong with it, and if you want to keep your spending under £100, it's definitely the one to go for.

Best ADSL Router: Netgear D6200 (£110)

Another dual-band AC1200 router, the Netgear D6200 is still technically mid-priced because the extra money you spend on it is going on a built-in modem. The Netgear name has long been associated with high-quality routers, and this one isn't any different in that regard. HD streaming is more than possible on a router of this speed, and the ReadyShare Cloud allows both local and remote network access to any attached storage device.

A gigabit WAN port is an essential inclusion on routers of this type, allowing you the potential to attach an upgraded modem without junking your router. Whether you're looking to the future or want the ability to switch to cable without replacing all your hardware, the D6200 lets you do it safe in the knowledge that the WAN port isn't going to turn out to be a speed bottleneck.

Unlike many models of router, the NetGear D6200 comes with a true remote management tool: Netgear Genie is available for PC, Mac, iOS and Android, and allows you to manage, monitor and repair your network from virtually any device. Other features include an AirPrint wrapper, which turns any networked printer into an Apple-compatible printer, and a media-manager, which allows access to media files accessible from the network. You can even turn your connection profile into a QR code so other hardware can easily connect to your network by scanning it.

All things considered, we reckon that the Asus RT-AC55U has slightly more features but that's punching significantly above its weight. If you want a router with a built-in ADSL modem as well, this is an ideal choice.

Best High-End Router: Asus RT-AC87U (£160)

The Asus RT-AC55U might be good, but if we had unlimited money to spend on a consumer router, there's a very good chance this would be the one we'd go for. The Asus RT-AC87U is about as fast as consumer routers get, with multi-band communication speeds that allow it to reach a theoretical maximum of 2300Mbps – enough for smooth 4K and ultra-HD video playback over a network, and ideal if you have a 4K TV that needs media server access.

It's a cable router, but the uplink port and gigabit Ethernet sockets mean you can get it working on an ADSL connection if you want (or you can go for its linemate, the slightly slower Asus AC1900 DSL-AC68U). It has both a USB 2.0 and a USB 3.0 expansion ports, capable of sharing storage, mobile internet and printers, and its backend is fast, modern and super-easy to use – a world away from the generic web-based interfaces most routers apologetically serve up.

As if that wasn't enough, it has more features than you could shake a stick at. It supports no less than six guest networks, can be run as a bridge, access point or repeater and comes with free access to a variety of Asus services, including cloud services and anti-virus protection. It is, quite simply, the Rolls Royce of router hardware, and if it seems expensive, that's only because it's got everything. At least you know that if you spend the money, you'll never have to but another router again.

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Fastest Router: D-Link DIR-890L (£280)

If you want to get the fastest wireless speeds available in any home, the D-Link DIR890L is probably the device you need. Sure, it's priced like it's made out of gold, but a blistering AC3200 – that's 3.2Gbps – is probably going to offset any fears that it isn't living up to its price.

The router uses Tri-Band technology to achieve these speeds, meaning it has no fewer than six external antennas. A 600Mbps 2.4GHz network combines with two 5GHz 1300Mbps networks for superior speed – and while it does require you to have the network adaptors capable of hitting similar speeds if you want the full effect, it's best used for houses where there are multiple devices operating simultaneously with high demands.

The features are generally high-end, with parental controls, device black and white listing, internet activity monitoring and built-in guest network functionality. Intelligent prioritisation will connect you to the fastest of its networks where possible, and a 1GHz processing core means even heavy traffic won't slow it down, keeping lag times as low as possible. USB sharing and gigabit Ethernet are, of course, included.

Still, for nearly £300, you'd expect the hardware to be good, so it's lucky that it really is. It's an ideal piece of hardware for professional gamers looking to prevent lag, media streaming users with an eye on 4K or higher-than-average communal use. Provided you can afford it, there's nothing but good things to say about it.

Best Mid-Price Model: Belkin Wireless AC1200 (£113)

If you want a more conventional router, with a built-in ADSL modem and the ability to take advantage of even faster multiplexed Wireless AC transmissions, the Belkin AC1200 is worth checking out. It's expensive compared to most other routers, but compared to other Wireless AC routers, it's surprisingly reasonable. If nothing else it's dropped almost £100 in the last year alone, so it should give you an idea about the state of pricing in the Wireless AC router market.

Most of the feature-set is fairly standard, with four gigabit Ethernet ports, two USB 3.0 ports for detachable storage and some one-touch configuration buttons, but again you're getting the reliability and quality of the Belkin name. If anything's likely to be a problem, it's that the AC1200 is quite old as Wireless AC routers go, and that means it's very much a first try at getting one right. Newer and more expensive Belkins offer performance that, while not necessarily faster, is certainly less variable. For some people, that's not going to make the price easier to swallow, but it's hard to get better for less. If you're not willing to spend £100+ on mid-level equipment, Wireless AC might not be for you. **mm**

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Network Troubleshooting

If things aren't going as planned, don't panic...

Once you have one set up, a home network can quickly become impossible to live without – but when they go wrong, they can be a source of endless frustration and despair. Troubleshooting a network is anything but easy. Problems can occur almost anywhere along the communication chain, be they physical, logical or electrical, but the fault will look the same regardless.

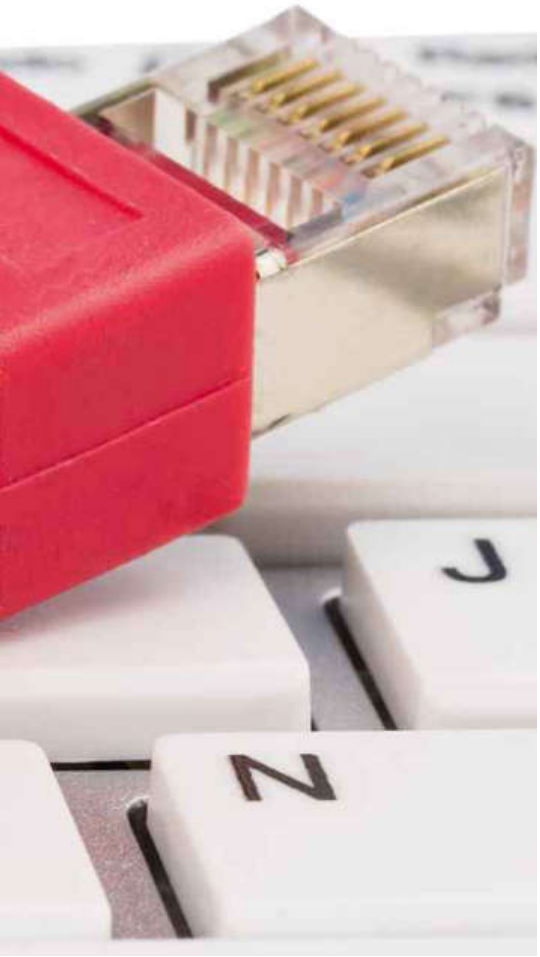
As a result, the list of potential solutions can be nearly endless. Maybe the problem is on your computer. Maybe it's the one it's trying to talk to. Maybe the router has overheated, the cables have snapped or the network adaptor's drivers have got a bug in them. Maybe the software is configured wrong, or maybe it's the wrong kind of software entirely. If you're using wireless, the problem could even be that someone in a different house entirely has moved their own router around, causing invisible, signal-weakening interference. At a glance, it's rarely easy to tell what's wrong.

To make matters worse, when your network is down, you can't even get online to Google the problem. It's just you, your wits and a near-incomprehensible router administration page to guide you. Unless, of course, you have this article handy.

First Things First

So your network connection isn't working properly. Where do you even begin?

Before you try anything, you need to check whether your computer and hub (be that a router, switch or otherwise) are actually capable of communicating with one another. Always start with the basics.



“Your network connection isn’t working properly. Where do you even begin?”

This means checking that your network hardware is actually receiving power, which is most easily done by checking its LEDs. Even hubs and adaptors that aren’t actively transmitting data should emit some sign of life, even if it’s just the occasional flash as it tests for an available connection.

In the case of network hubs, a lack of power should be easy to diagnose and repair (check the power leads and socket), and at worst you might find yourself having to replace a fuse or switch plug sockets. At best, it’ll be a loose cable or accidentally flipped switch.

With adaptors, you’re in a much more precarious position. USB adaptors can simply be swapped between ports, so try the main ones at the rear of your base unit (if it’s a desktop system) for the quickest results. They’re attached directly to your motherboard and thus have the best chance of working. If the adaptor doesn’t wake up, then either the LEDs are broken (unlikely) or the USB adaptor itself is dead and should be replaced.

Internal network adaptors are a little bit more of a chore to move, especially if you don’t have any PCI slots free. Before you take the step of opening your PC, we recommend checking the Windows device manager. If the network card is present and free from errors, it’s probably receiving power regardless of whether the LEDs are going or not, so use that to guide your decision.

In the case of wired networks, you also have to check the network cables. It’s not impossible that they can get pulled out, so give them a good push into their sockets and check for any nasty twists or nicks that might have broken the internal wiring. Replace any damaged cables before doing anything else.

At this point, if you’re sure that everything’s powered up and undamaged, you can start having a look at what else might be going wrong.

1. You Can’t Reach Web Pages

Probably the most common problem you’ll encounter is a network that seems to be working but won’t allow you to visit web pages. Here’s how to go about solving this excessively annoying problem.

The first thing to do is check whether you’re connected to the router. Check the network icon in the system tray. If your wireless (or cable Ethernet) network isn’t connected, it’ll have a small ‘X’ by it. You must be connected to the network to share its internet connection, so if you aren’t, it could mean that your network hardware has lost power or become faulty, that the signal has been interrupted or that the software is misconfigured. Try connecting to the network manually and it should work.

That’s a relatively easy fix, but it’s also less likely to occur than its more frustrating variant: you’re connected to your network but can’t still reach web pages.

In this circumstance, there are a few problems worth eliminating. First, check that you can access your router’s administration system. You’ll normally need to browse to 192.168.0.1 or 192.168.1.1 in your browser to do so. If this connection succeeds, you know the problem isn’t the router. If it doesn’t, it’s possible that the router has crashed (do a hard reset), though it might also mean that the wireless signal is just too weak to establish a proper connection (test it using a mobile device positioned near to the router).

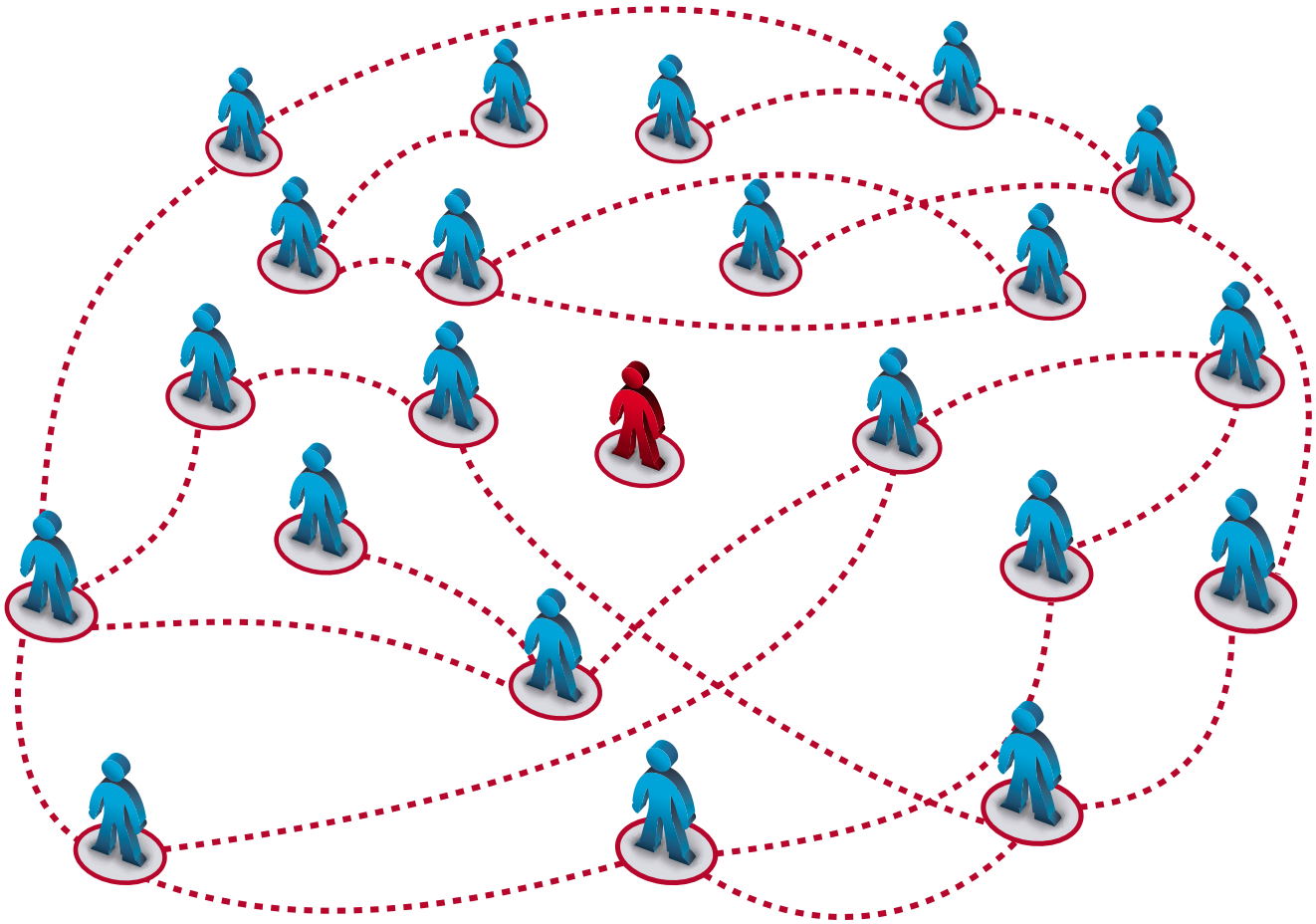
If that doesn’t work – particularly if you’ve rebooted the router and still can’t load web pages – then it’s likely that the problem is on the ISP’s end. But it doesn’t mean all is lost! Have a look at the lights on your router. If the one marked ‘ADSL’, ‘DSL’, ‘Cable’ or sometimes ‘Internet’ is switched off, then it means your modem has no signal. If the modem is integrated into your router as most modern ones are, that’ll be because the internet connection has gone down. In this case, all you can do is wait for the ISP to fix the problem, but call it to make sure there’s a fault on its end.

A slow flashing light on the same LED means that the modem is trying to reconnect. Only a light that’s switched on indicates a usable internet connection. If you still can’t get to web pages, it might be because your ISP’s DNS server has gone down. In your router’s admin page, change the first two DNS servers to OpenDNS servers by entering the following IP addresses: 208.67.222.222 and 208.67.220.220. Make a note of the ones you change! Reboot your router and it should – hopefully – be working now.

2. You Can’t find The Wireless Network You Want

Being unable to find the wireless network you’re looking for is one of the most irritating problems for wireless hardware, though 90% of the time it only means that the access point has just reset itself, and the network will reappear as soon as it’s finished rebooting and re-initialising. The other 10% of the time, it’s the indication of a much bigger problem.

Being unable to see the network name you want in your list of available networks means, on its most basic level, that your wireless antenna isn’t picking up a signal



“Being unable to find the wireless network you’re looking for is one of the most irritating problems for wireless hardware”

from which it can extract the network name (SSID) and display it. Several things can cause this, so we’ll try to help you eliminate them in a logical order.

First, check whether you can see any other networks in the list, even if you can’t connect to them. Assuming you’re not living in a lone house with miles of farmland in every direction, you should see a few other wireless networks around. If you can, you have good reason to believe that your wireless adaptor is working fine. If you can’t, then the problem might be that the antenna isn’t working properly. Check that it’s powered up and, if it’s a full-size aerial, that it’s properly screwed in. Detachable antennas can occasionally unscrew themselves over time, just through being knocked and manipulated, and if they come loose they may be unable to transmit a signal.

If the adaptor definitely working, then the next thing to check is whether the SSID is actually being broadcast. Assuming you’ve checked the wireless access point’s power (remember that even after being switched on, a router takes a minute or two to start broadcasting the SSID), then the best thing to do is quickly check another wi-fi capable device to see if that can pick up the SSID.

If it can’t, then you know that the SSID isn’t being broadcast, which can be a consequence of three different things: that the wireless isn’t active, that the SSID has been voluntarily suppressed or that the range simply isn’t long enough to reach the antenna.

Eliminating the third option there is easiest, so do that first. If you have one, use a phone, tablet or laptop and move it closer to the wireless access point’s location. If you only have one computer, see if there’s a way you can simply move it and the wireless access point closer together. If the SSID eventually appears, you know you have a range problem on your hands. If it doesn’t, then you know the problem is one of the other two.

It’s also possible that the wireless access point is simply hiding the SSID on purpose. This is (erroneously) considered to be an effective security measure by some, so it may have been activated by a well meaning but mistaken individual.

Luckily, you can tell your system to manually look for an SSID by typing the name in, so as long as you remember what it is this potential cause can be quite quickly eliminated. In Windows 7 onwards, you can accomplish this by clicking Control Panel > Network and Internet > Network and Sharing Center > Set Up a New Connection. You’ll be prompted to enter an SSID.

If you do, and it exists, the wireless connection will be established. To cement its re-appearance, you have to right-click on the relevant network icon and select ‘Properties’. Here, in the ‘connection’ tab, there’s an option that reads ‘Connect even if the network is not broadcasting its name (SSID).’ Check the box and click OK. If the network is active but hiding its SSID, that will restore

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normal functionality. You then have the option to leave things how they are, or go into your router's admin pages and re-enable SSID broadcast.

However, if that doesn't have an effect, then the only remaining cause is that the wireless access point has stopped working for some reason.

The best course of action at this point is to connect to the wireless access point using an Ethernet cable and manually enter the administrative backend. See if the wireless (WLAN) signal has been disabled, and if it has, switch it back on. If it's already enabled, you may have a hardware problem with the router's antenna, so again check that it's working and intact.

If, for some reason, you can't access the router via Ethernet or any other device's wireless signal, then your only remaining hope is to do a factory reset on the wireless access point and hope that this re-enables the wireless. Most wireless access points come in the box with wireless enabled by default, and assuming there isn't a manual switch for enabling and disabling the feature, a factory reset is the only way to turn it on without accessing the router's backend. Factory resets are often accomplished using pinhole buttons, but there may be other conditions required. Consult your device's manual before going any further, and be aware that a factory reset can wipe all customisation, which may include your login credentials!

3. You Can't Connect To A Wireless Network

Being unable to connect to a network is, in many ways, more frustrating than being unable to find it at all. In this case, you know that the network is available but something is preventing a stable, open connection from being established. The key to fixing the problem is identifying the true cause of this behaviour.

If the network uses encryption, it's probable that the thing preventing you from connecting to it is an incorrect password being used. If you're manually entering the password, double-check with your source that it's correct and that you're typing it correctly. If that doesn't help, or if you have a stored password that suddenly stops working, then the problem is likely to be that someone has changed the wireless password.

In this case, if you can't get the correct password off someone, your choices boil down to the same as earlier. Either you can find an Ethernet cable, connect your device directly to the wireless access point and use the administrative backend to enter a new wireless password, or you can perform a factory reset and use the default wireless password, which should be printed somewhere on a sticker found on (or underneath) the device.

If the password isn't what appears to be at fault (i.e. at no point are you asked to enter a password, implying that the one you're using is correct), then the problem is probably something far harder to get a handle on: a software misconfiguration. The quickest way to a solution is to reset both the wireless access point and your PC and hope that whatever was conflicting gets shaken out in the respective reboots. Yes, we did seriously just tell you to try turning it off and on again.

But if that doesn't work, maybe the configuration conflict can be solved by changing the network adaptor's settings to 'automatic'. To do this, left-click on the connection icon, right-click on the affected network, and then choose 'Open Network and Sharing Center' from the context menu. From here, click the link next to the 'Connections' heading to open the connection properties, and then in the dialogue that appears, click 'properties' in the bottom left. Find the label 'Internet Protocol Version 4'. Double-click it, change both options to 'Obtain Automatically', then click OK and reset the connection. If a configuration conflict was at fault, this will hopefully straighten all that out.

Finally, there's also a small (but non-zero) chance that your access is being rejected based on the wireless adaptor's MAC address. Filtering by MAC address is unusual and relatively ineffectual in security terms, but it can be the one stop that prevents someone with all the necessary details – the SSID and correct encryption password – from connecting to a network. This has to be manually enabled, but if you can't get into the wireless access point's admin pages to look, whether using a wired Ethernet connection or a working wireless device, then once again a factory reset is your final recourse.

As well as covering the most common, basic problems, this piece should also give you the information you need to diagnose more general issues. Follow the same logical approach and you'll soon be able to pinpoint what's wrong (and fix it) using little more than experience and intuition – something that's undeniably quicker to do. Until then, use the longer methods, and console yourself with the knowledge that it'll be put to good use one day... **mm**

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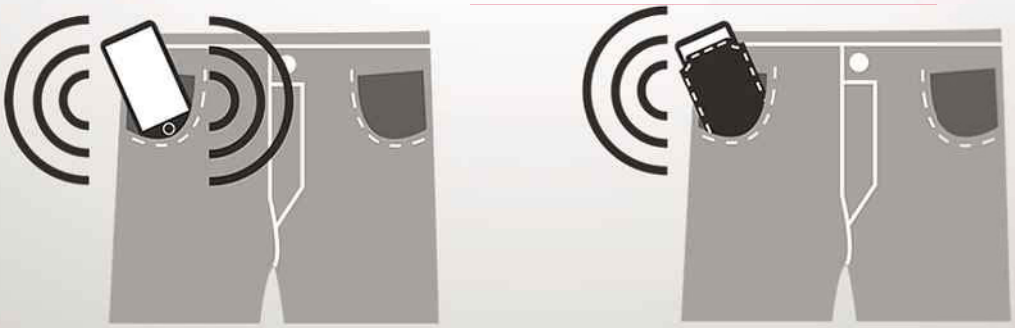

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Networking Standards Explained

There are a lot of different types of wi-fi, but what do they mean to us?

Wireless technologies come in many different forms, and figuring out what devices support the different protocols – and why it matters – isn't easy if you haven't kept up to date with it. How come some wireless connections are faster than others, for example? Why should you care which particular version of wi-fi your router supports, and does it really matter whether you're using the 2.4GHz or 5GHz band?

The answers to these questions lie in understanding the difference between one standard and another. Knowing what version of any given technology is being used is essential for making an informed purchase, but it's also useful for troubleshooting and finding faults, and for learning how long your latest piece of hardware is likely to remain competitive in a fast-changing market. It's even just interesting to know!

For those reasons and more, we've put together a crash course in the most common types of wireless network protocols: what they are, what they do, and why you might care.

Six Protocols, One Name

Perhaps confusingly, the term 'wi-fi' covers a variety of very similar (but materially distinct) wireless communication standards. Each of them has their own quirks and qualities, and just because one piece of equipment supports one type of wi-fi it doesn't automatically follow that it will be compatible with another. With that sort of vague application of the term, you might think it something of a miracle that wi-fi is as popular as it is.

To illustrate, there are currently four versions of wi-fi that you might class as being 'common'. The standards have the catchy names of 802.11b, 802.11g, 802.11n and 802.11ac. They were all created by the Wi-Fi Alliance, which is composed of and sponsored by companies such as 3Com, Cisco, Apple and Microsoft that have an interest in bringing the technologies to market. The name of each technology refers to the standard's IEEE (Institute of Electrical and Electronics Engineers) number, which distinguishes it from any other existing standard.

The original wi-fi standard was IEEE 802.11. Created in 1997, it offered megabit-speed connections and has been defunct for well over a decade. Indeed, it's so slow and old that modern devices are almost certainly incompatible, though if you can prove otherwise we'd like to hear from you. It was the first version, though, and subsequent iterations of wi-fi are all derived from it.

It was just two years afterwards that the first major rework of 802.11 was released. 802.11a was the first version of wi-fi to operate on the 5GHz frequency band, a shift designed to reduce the amount of interference found on the more crowded 2.4GHz frequency band. 802.11a was much faster than the vanilla 802.11 standard, with speeds of up to 54Mb/s (megabits per second), but its use of the 5GHz frequency band meant it had poor range as signals at that frequency are more easily absorbed, which leads to a lower effective distance.

However, a standard created at the same time as 802.11a, 802.11b, used the more common 2.4GHz band, giving it better range even though it had a much slower maximum speed of only 11Mb/s. It was this standard that finally brought wi-fi into commercially viable territory, allowing fairly fast enough transfer speeds over distances that made it practical for home use. Most modern network devices still support 802.11b, even though it's unlikely to be the best choice in practise. It took another five years until the design of the third standard – 802.11g – was complete, and this helped turn wi-fi from an interesting luxury into a reliable alternative to cabled networking, with transfer speeds of 54Mbps over the 2.4GHz band.

An even better standard, IEEE 802.11n (or Wireless N to its friends) was created in 2009, and six years later it's only just giving up its dominance. Wireless N was more expensive than Wireless G, but with good reason – the standard could operate on both the 2.4GHz and 5 GHz frequencies, and supported multi-channel use. This meant a theoretical maximum operating speed of 600Mb/s. Speeds of 150Mb/s and 300Mb/s were certainly not uncommon, though, even if home networks rarely pushed the limits to that extent. Of course, streaming HD video has placed high demands on current networks, and even Wireless N is being replaced by a new, faster protocol.

Wireless AC

The latest and fastest iteration of this almost constantly evolving protocol, Wireless AC (IEEE 802.11ac), was only officially released at the end of 2013, though hardware supporting the new standard actually came out a little sooner. Although the standard only operates on the 5GHz band, Wireless AC certified hardware must also incorporate a 2.4GHz antenna to ensure backwards compatibility with Wireless N and G devices. The practical upshot of this is that most Wireless AC routers and switches support every previous iteration of the wi-fi standard by providing two separate access points: a 2.4GHz Wireless N option, and a 5GHz Wireless AC one. These can generally be run in multi-channel configuration, where the feature is supported.

Wireless AC's chief advantage over previous versions of wi-fi is its speed. A single Wireless AC connection alone will provide a connection of up to 433Mb/s, but this is usually paired with a single Wireless N connection (150Mb/s) to give a minimum speed of 600Mb/s (often annotated as AC600). Even faster combinations do exist – dual N, dual AC (1200mbps) is common – but the fastest hardware has a throughput of 3200Mbps – 600Mbps on Wireless N and 2,600Mbps on Wireless AC.

AC is faster than N, but it does have one disadvantage: a shorter maximum range of just 35m due to its use of the 5GHz band. However, the fact that most AC access points also run an N access point compensates for this shortfall. It also means your network will cover the same area as its older Wireless N incarnation, though you'll have access to higher-speed Wireless AC coverage when you're close enough to the access point.

These days, Wireless AC is found in a large number of new devices, though it's not entirely out of the question that hardware will only have Wireless N support – especially when it comes to things like motherboard-integrated wi-fi. The latest high-end tablets and smartphones now offer Wireless AC support, but older and cheaper devices may not go beyond Wireless N.

> **"A single Wireless AC connection will provides to 433Mb/s, but this can be paired with a Wireless N connection (150Mb/s) to give a minimum speed of 600Mb/s"**

Still, the big advantage of wi-fi is that because the standards are so closely linked, most devices support multiple iterations. That goes double for Wireless AC devices, which – software permitting – support every iteration of wi-fi thanks to their dual antennae certification.

It's worth pointing out that even then, the connection speed between a router and a network device will only be as fast as the slower of the two. If you have a Wireless N router, don't expect 100-megabit speeds from your 802.11g network card! Despite this, the backwards compatibility of wi-fi means it's less than a headache than some of the alternatives, and that's what kept it afloat while its competitors sank. And that's why whatever follows – and you can read more about those elsewhere in this issue – are likely to be based on existing wi-fi technology too. **mm**

Next-Gen Networking Standards

What will the wi-fi of tomorrow look like?

If the history of computing has shown us anything, it's that few technologies are so good that they can't get a little better. That definitely applies to wireless networking, which has had a new version released around every four years, on average, since it was first specified in the late 90s.

No sooner has Wireless AC, with its gigabit-level speeds and superior reliability edged its way towards becoming the dominant standard than companies are beginning to look towards future forms of wireless networking. After all, Wireless AC might be okay for streaming HD video, but what happens when you want to stream 4K video? Or if you want to provide networking coverage over areas greater than Wireless AC currently allows? Or if you want to do the same as Wireless AC connections, but with less power?

The answer, of course, is that you have to look to something new. And while it's not certain which one of these technologies will end up in our homes, there are several candidates already in various stages of development, which might provide the answer.

WiGig / 802.11ad

Originally managed by the Wireless Gigabit Alliance (WiGig) and later folded into the Wi-Fi Alliance, WiGig was a specification based on existing wi-fi (802.11) technology. As a modified version of the specification, it was named 802.11ad or Wireless AD.

The intention was to create a standard to enable multi-gigabit communication speeds between two devices. This did include wireless networking in the conventional sense, but also incorporated things like high-definition media streaming between stand-alone devices, such as speakers and screens, without the need for a router or other hub. Like existing forms of wi-fi, the Wireless AD specification communicates on the 2.4GHz and 5GHz bands, but unlike wi-fi it also incorporates the 60GHz band allowing it to reach speeds of 7Gbps.

The main problem is that 60GHz transmissions aren't particularly suited to wireless communication. 60GHz is an incredibly short wavelength by networking standards, which means that the transmissions are very susceptible to reflection and have difficulty penetrating walls and passing through other surfaces. It is essentially a short-range standard. To compensate for this, Wireless AD's protocol incorporates 'beamforming', which allows it to pick up radio waves that have been bounced off other surfaces, and it can seamlessly switch to a lower, more reliable frequency should the 60GHz transmissions become unstable.

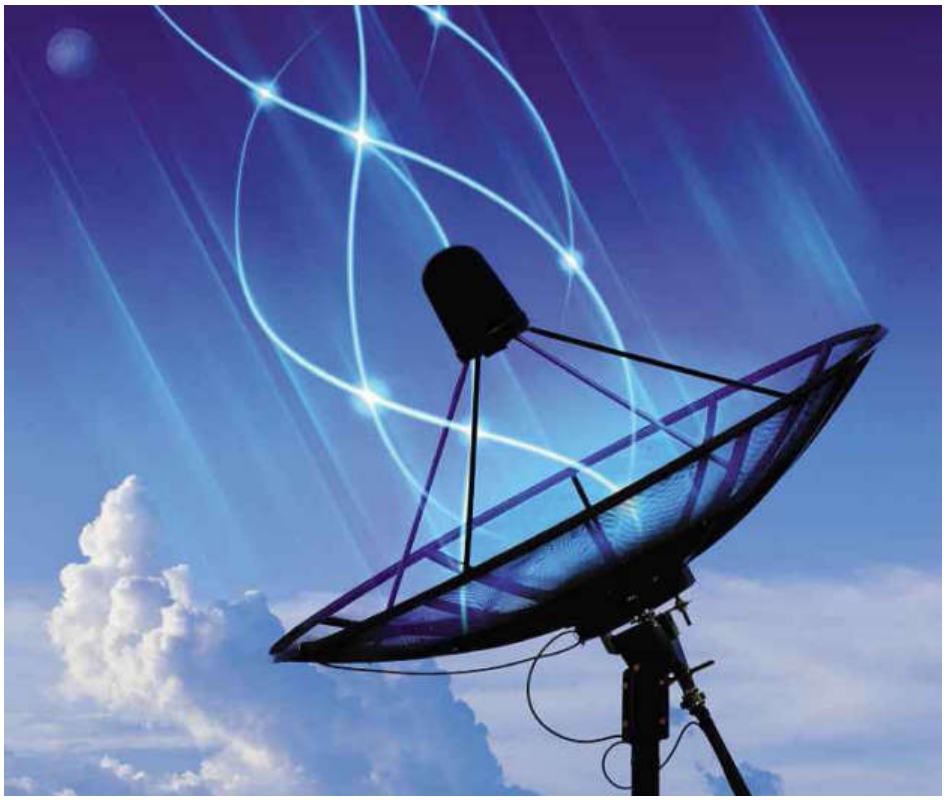
The incorporation of 2.4GHz and 5GHz bands into the Wireless AD standard does mean that Wireless AD hardware is compatible with existing wireless technologies, including Wireless AC, but tests have shown that it can experience difficulty if used alongside WirelessHD devices, which are already commercially available. This is because WirelessHD also uses the 60GHz band for its transmissions.

Although Wireless AD isn't commercially available in any hardware at present, it is most likely to appear first as part of the Wireless USB standard, which would allow high-speed device-to-device transfers using existing USB drivers. Ultimately, the fact that its speed is only in the same range as Wireless AC's theoretical bounds despite significantly increased complexity may prevent it from becoming the next official wireless networking standard.

Wireless AX

Perhaps the best candidate to succeed Wireless AC is Wireless AX. After all, it already has the backing of the Wi-Fi Alliance's VP of technology, Greg Ennis, who explicitly stated that the alliance expects Wireless AX to take Wireless AC's torch when the standard is complete. Of course, he also stated that he doesn't expect the standard to be ratified before 2019, so it could be a while before devices actually begin to appear.

On the other hand, the fact that the standard wasn't yet ratified didn't stop companies from releasing Wireless



AC devices, and the draft specification for Wireless AX will soon be complete enough that the hardware could be released as soon as 2016, provided there's a market for it.

Although Wireless AX is some distance off being realised, its goals and capabilities are already quite well-defined. Test hardware has already achieved speeds of 10.53Gbps using just the 5GHz frequency band, which is four to five times the speed of the fastest Wireless AC hardware currently available and around a third above Wireless AC's theoretical maximum. Even real-world speeds are expected to be in the range of 2GHz, which is five times what Wireless AC offers in most practical situations.

Wireless AX will also improve wi-fi's performance on other levels. Currently, crowded environments with large numbers of users are likely to impede wireless performance, making public hotspots comparatively hard to create and manage. Wireless AX will use its communication spectrum more efficiently to better manage interference and improve existing protocols, so public wi-fi becomes faster and more reliable even under heavy loads.

What makes Wireless AX most likely to succeed is that it is essentially the same model of wi-fi we're using now. Unlike the short-range focussed Wireless AD (and its long-range cousin, Wireless AH), Wireless AX will remain entirely on the 2.4GHz and 5GHz bands, meaning greater compatibility and easier manufacturing.

WhiteFi / 802.11af

One of the benefits of the UK switching from analogue to digital TV is that a huge chunk of the radio wave spectrum that was once occupied is now free. Areas of the spectrum with no official use are described as 'White Space' – so you can probably guess yourself what WhiteFi is.

Essentially, WhiteFi is designed to use unlicensed portions of the UHF spectrum to carry wi-fi signals. Where current devices operate in the GHz bands, WhiteFi would transmit between 54 and 790MHz. The benefits of such technology are numerous. A transmission range of several kilometres, high obstacle penetration, and simpler symmetrical implementation, meaning faster upload speeds for users are just some of the benefits such a technology could bring. Its range means that as well as providing long-range networking, WhiteFi could be used to provide broadband to areas where infrastructure is too expensive or too inconvenient to install.

As with existing wi-fi standards, WhiteFi is licence-free in the UK, meaning that anyone can buy and use the hardware to create a WhiteFi hotspot. Or, at least, they'll be able to when the technology becomes available. Sadly for anyone hoping to set up their own WAN, it's not quite ready for market yet.

Partly, this is because the technology is more complex than wi-fi. Its long range and position in the spectrum means the potential for interference is huge, so all WhiteFi devices in an area would have to communicate with a central database to check which power levels and frequencies are safe to use. It's clear how the system would work in theory, but it hasn't actually been implemented yet.

Speed is also an issue. The fastest implementations of 802.11af are still considerably slower than many of the alternatives, so it's unlikely that any commercial enterprise will turn its focus to implementing home versions of the technology. Without that level of appeal, it's always going to be a niche product.

In any case, the current development trend for wireless technologies is for them to follow in the footsteps of their predecessors. It may even be that technical and commercial limitations will soon prevent any more revolutionary refinements once Wireless AX is realised and the 802.11 standard has to be finally abandoned in favour of a completely new wireless networking solution. But for now, there are still improvements to be made, and for the next few years, there's still plenty of time left to make them. **mm**

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Understanding Bluetooth

David Briddock guides you through Bluetooth 4 terminology and technology

Wireless networking technology, once seen as miraculous by many consumers, is now treated as an absolute necessity for any computer, mobile device or personal gadget. The now-ubiquitous wi-fi protocols are the technology most people will instantly think about, but for years mobile devices have invariably incorporated a wireless variant called Bluetooth.

Bluetooth technology was designed as a low-power, low-cost wireless alternative to cable for peer-to-peer connections. It can be found in billions of environments such as PCs, mobile devices, wearables, home automation, in-car entertainment, medical equipment and so on. However, the latest Bluetooth 4 standard encompasses a complex mix of names and wireless technologies: Classic, Low Energy, High Speed, Smart and Smart Ready.

This article is all about helping you understand this terminology and what to look out for in your next PC, laptop, tablet, smartphone, smartwatch or fitness band.

In The Beginning

During the 1990s Ericsson employees Japp Haartsen and Sven Mattisson were investigating a short range wireless replacement for serial data cables. Based in the company's Lund research labs, deep in the south of Sweden, they finally settled on short-wavelength UHF radio waves. Ranging from 2.4- to 2.485GHz these frequencies belong to the industrial, science and medical (ISM) radio band. The duo's intention was to deliver a localised wireless personal area network (WPAN) for any personal computer or mobile device within range. To create this network, while avoiding the expected interference issues, they drafted a specification based around a frequency-hopping spread spectrum technique.

Their work for Ericsson soon attracted interest from other big players in the personal computer and mobile phone arena. So, in 1998 Ericsson teamed up with IBM, Intel, Toshiba and Nokia to form the Bluetooth Special Interest Group (SIG) to take on the responsiblity for formalising the Bluetooth specifications, while also managing the qualification program and trademark protection. This meant any licensed Bluetooth device must adhere to the SIG standards and associated patent network.

Today SIG membership extends to almost 20,000 companies worldwide, spanning areas such as telecommunication, computing, networking and consumer electronics.

Strange Name

So, where did this unusual name come from? Before a formal name was agreed Intel suggested the codename Bluetooth. A name borrowed from the 10th century second King of Denmark, King Harald Bluetooth, who was famous for uniting Scandinavia. To many SIG members it seemed appropriate for a technology intended to unite the PC and cellular industries via a short-range wireless link. Thus, when no alternative names were proposed, the Bluetooth name stuck.

Bluetooth Basics

Bluetooth devices can form short-range, ad hoc networks known as piconets. Piconets are established dynamically as Bluetooth-enabled devices enter and leave the radio proximity. Each piconet can simultaneously communicate with up to seven devices and each device can also belong to several piconets simultaneously. The technology also has the ability to simultaneously handle data and voice transmissions. This makes it an ideal solution for devices like hands-free headsets.

Bluetooth is a low-power technology that can be powered down when inactive. However, maximum wireless range is related to power. To clarify the situation each chipset implementation will conform to one of three distinct classifications (see boxout).

Interference is another obstacle. Bluetooth technology uses a technique called adaptive frequency hopping (AFH). Working within its radio spectrum it identifies frequencies that aren't used by other devices.

Bluetooth security counteracts so called Man In The Middle (MITM) scenarios, where an intruder intercepts the

communication link. MITM attacks include Bluesnarfing (device data extraction), Bluebugging (taking control of a Bluetooth device) and Bluecasting (broadcasting adverts to Bluetooth devices in the vicinity).

Specification History

Since its formation the Bluetooth SIG has published four major versions of the specifications. Each new version includes backward compatibility support for previous specifications.

Early Bluetooth versions (1.0, 1.1 and 1.2) concentrated on improving robustness, reliability and interference-resistance with various transmission-centric refinements. The 2002 version – 1.2 – supported Basic Rate (BR) transmissions, that provided speeds up to 1Mb/s.

Version 2.0 was adopted in 2004 and introduced Enhanced Data Rate (EDR) for faster communication speeds of up to 3Mb/s. Bluetooth v2.1 also introduced a Secure Simple Pairing (SSP) mechanism. This used a form of public key cryptography to automatically paired screen-less and keyboard-less devices (like Bluetooth headsets).

Version 3.0 appeared in 2008 and introduced preliminary support for a High Speed Bluetooth (more on this later).

Bluetooth 4.0

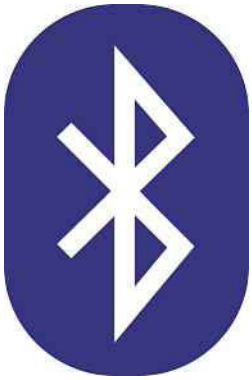
The most recent major update of the Bluetooth SIG's Core Specification, namely version 4.0, was adopted in 2010. Since then the SIG members have agreed on a few minor updates, the current one being 4.2 (**goo.gl/oKZCmX**).

Unfortunately, the version 4 specification embodies a number of quite different technologies. For instance there's Bluetooth Classic, Bluetooth Low Energy (BLE) and Bluetooth High Speed. And, other than the name Bluetooth there isn't much similarity between these technologies. Consequently, knowing a PC, laptop, smartphone, tablet, or other device supports Bluetooth 4 doesn't tell you very much.

Bluetooth Smart

In an effort to clarify the situation SIG introduced the name Bluetooth Smart. When you see the Smart badge you'll know the device offers an advanced set of functionality that includes:

- low power consumption
- enhanced range
- robust communication
- strong security (AES-128 encryption)
- multi-vendor interoperability
- low implementation cost



The Bluetooth logo

A typical Bluetooth dongle

Bluetooth Classes

Bluetooth devices are divided into three power classes based on the signal strength of the transceiver and its maximum power consumption. The effective range is typically smaller than this maximum figure due to external and environmental conditions.

- **Class 1:** maximum range of 100 metres and maximum power consumption of 100 milliwatts (mW) .
- **Class 2:** maximum range of 10 metres and maximum power consumption of 2.5mW (this is the most common class).
- **Class 3:** maximum range of one metre and maximum power consumption of 1mW.

Bluetooth SMART

Bluetooth SMART READY

Conservation of battery life is a key feature. A Smart device remains dormant unless data is being shared, something that wasn't possible in previous generations of Bluetooth technology due to technical issues when pairing some Bluetooth-ready devices. So, if you share a photo between two Smart Bluetooth devices, the connection becomes active while the transfer begins then returns to a 'sleep' state upon completion.

Smart Ready Vs Smart

However, the Smart badge tag has some subtle differences in naming that can easily catch you out. For example, some devices are labeled as 'Bluetooth Smart Ready'. These devices act as a hub, or central device. This means they can initiate and accept communication pairing requests with other Bluetooth devices. Typically they'll incorporate a screen and a keyboard or touchscreen; examples include PCs, laptops, tablets, smartphones and smartwatches.

Other Bluetooth 4 devices come with a 'Bluetooth Smart' label. These are defined as peripheral devices, which connect to a central hub. They need to pair with a Bluetooth Smart Ready device before they can start doing something useful.

Many of the latest small, screen-less and keyboard-less devices are Smart candidates, such as wireless headphones, smart toothbrushes, game controllers, a multitude of sensors and beacon-based payment processors.

Now let's discover what Classic, Low Energy and High Speed really means in practice.

Classic Bluetooth

The culmination of the core Bluetooth specification since its introduction is wrapped up in something called Classic Bluetooth. In practice that means the standard incorporates the Basic Rate (BR) transmissions, Enhanced Data Rate (EDR) and Secure Simple Pairing (SSP) mechanism technologies we mentioned above and progressively added to over the years.

As for adaptive hopping in Classic Bluetooth this is done over 79 frequencies at 1MHz intervals. Typical devices that would make use of Classic Bluetooth include PCs, along with older laptops, smartphone and tablets. They invariably support Class 2 range and power capabilities (see boxout).

Bluetooth headset

Bluetooth in the car

Bluetooth LE

Bluetooth Low Energy (provisionally known as Wibree and then BLE) is a subset of Bluetooth 4.0. However, it has an entirely new protocol stack designed specifically to rapidly create simple links while using very low levels of power. In contrast to Classic, the Low Energy specification defines 40 distinct 2MHz wide channels. These channels operate at a speed of 2Mb/s, the low power profile precluding higher speed data transfer rates.

However, LE's low power demand is typically between one half to one hundredth of that required by Classic, allowing devices to run for months or even years years on a small coin-cell battery. This has encouraged manufacturers to integrate Bluetooth into small, low-cost, battery powered devices.

BLE devices can reportedly establish a connection, transmit data, and terminate the connection in just 3 milliseconds. In contrast earlier Bluetooth versions required about 100 milliseconds. This capability, combined with intelligent sleep-when-idle algorithms, drastically reduces the time spent at high power consumption levels. Also, a broadcast feature allows devices to continually send out data to observer software on other devices.

Bluetooth High Speed

Bluetooth High Speed (HS) technology (also known as ZigBee) is designed to rapidly send video, music and other large files between devices. It was first announced in April 2009 as part of the Bluetooth Core Specification version 3.0 + HS. The goal was to deliver a simpler and less expensive wireless technology than alternatives like wi-fi and Wireless Personal Networks (WPANs).

Bluetooth SIG

The Bluetooth Special Interest Group (SIG) was formed in September 1998 and now has more than 20,000 members. Promoters are the most active SIG members and have considerable influence over both the strategic and technological directions of Bluetooth as a whole. They include founder members Ericsson, Nokia, Toshiba and Intel who've now been joined by Microsoft, Lenovo and Apple.

SIG members participate in Study Groups, Expert Groups, Working Groups along with committees.

Study Groups perform research that informs the development of the Bluetooth specifications, and may eventually become Working Groups in their own right.

Working Groups develop new Bluetooth specifications and enhance previously adopted specifications.

Expert Groups deal with Bluetooth technical issues, reporting back to the Working Groups.

SIG Committees deal with licensing, marketing and specification reviews, testing methodologies and control of the qualification process.

Based on an IEEE 802 type standard its transmission distances are limited to a line-of-sight of 10 to 100 meters, depending on power output. Greater distances can be achieved by passing data through a star, tree or mesh network of intermediate devices. Through higher-than-Classic power demands HS can support speeds up to 24Mbps. And the Unicast Connectionless Data strategy lowers latency rates, which means small amounts of data can be sent more quickly.

Enhanced power control techniques limit the number of connection drop-outs. Which means users are less likely to lose a headset connection, even when the hub device is in a coat pocket or bag.

> **"LE's low power demand is between one half to one hundredth of that required by Classic"**

HS applications include wireless light switches, electrical meters with in-home-displays, traffic management systems plus any other consumer or industrial devices that requires shortish-range, low-rate wireless data transfer.

Another obvious example is in-car entertainment, where multiple video screens and audio channels can be synchronised without the need for long, complex and failure-prone wiring schemes to get the job done.

Finding Out More

If you're looking for more in-depth technical information, visit **Bluetooth.org** and sign up as a member. Here you'll find a large Technical Resources section that cover the Bluetooth core specification, profiles, qualifications, testing and much more. The site is run by the Bluetooth SIG and serves as the definitive source of information for the various SIG programs and initiatives plus Bluetooth technology development. **mm**

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Surround Sound Headphones For PC Gaming

Surround sound is a common feature of modern games, but how well can it translate to headphones?

Audiophiles know that a good pair of headphones can produce sound better than any speaker, not least because they can deliver a far more nuanced set of frequencies directly into your ears. That's fine if you're listening to something that was mixed in stereo – most audiophiles are, after all – but what if you're a gamer or a movie fan? Are there headphones that can give you the full immersive experience of surround speakers AND the nuance and subtlety of high-quality, up-close output?

If you believe manufacturers, the answer is 'yes'. Surround-sound headphones – that is, headphones that deliver positional audio to each ear in the same way speaker systems aim to – have been slowly growing in popularity in recent times. Through a combination of engineering tricks and software processing they claim to offer the same type of three-dimensional experience that surround sound speakers are famed for. The difference is, they do it using a fraction of the space, cost a quarter of the price, and do it in a way that means you won't have the neighbours banging on your wall at 3am.

Surround sound headsets are particularly aimed at gamers on the basis that they let them take advantage of positional audio in games. In theory, you get greater awareness of 3D space in-game, which makes the experience more immersive and – at least in professional gaming circles – is something seen to give you an edge over the competition. Whether it's true or not is debatable. It probably depends on your individual play style and how much attention you play to the audio versus other feedback mechanisms in a game. Certainly, it isn't going to hurt your chances, though!

Types Of Surround Sound

If you want to try surround headphones out for yourself and discover for yourself whether their claims stack up, there's a little jargon associated with the technology that you need to learn. Primarily, there are two types of surround sound that can be offered by headphones: virtual and true.

In virtual surround headphones, the surround sound effect comes from a combination of two stereo speakers and software processing that aims to simulate a surround effect. This is considerably less expensive than the alternative, and it can also provide sound that's more powerful and with a greater dynamic range. As you might guess, though, the surround effect is considered weaker than true surround and may be almost indistinguishable from a pair of high-end stereo headphones.

If you want to make sure whether headphones are simple stereo or stereo with virtual surround, look for mention of HRTF abilities. HRTF stands for 'Head-Related Transfer Function' and it uses a binaural effect to create positional audio. Without HRTF processing, you'll only hear a standard, non-positional stereo sound. Similarly, any headphones claiming 5.1 or 7.1 equivalence while only containing two drivers are also virtual surround.

True surround headphones contain multiple speaker drivers per ear – usually a single large driver for the main audio, and then smaller 'satellite' drivers positioned around it to help create the feeling of positional or moving sound. The effect on this type of hardware is far more pronounced, but also far more expensive – especially if you go for one offering full 7.1 sound. We've actually yet to see a pair of headphones with seven drivers per ear, but read our box-out for why the issue of 5.1 versus 7.1 sound is already contentious with regards to gaming.

Regardless of the type of surround sound they contain, it's worth noting that surround sound headphones tend to offer a lower-quality sound than similarly-priced stereo headphones, either because part of their price is put towards audio-processing hardware instead of high-quality drivers or because they have more drivers rather than better ones. If you're sensitive to audio quality, keep in mind that you have to spend a lot more money on surround sound headphones to hit the high levels you might be accustomed to.

Other than that, surround sound headphones generally have the same levels of variation in terms of specification (ans, indeed, quality) as you'll see in standard headphones, which is to say some will be wireless, some will be wired, some will have microphones or detachable cables or a foldable headband or carry case. However, since those aren't the main selling points of surround sound headphones, we won't go into too much detail over those features in this article, suffice to say that the market for surround headphones is smaller, so the chance of finding one with every feature you want declines rapidly if you get too specific. You may have to accept some level of compromise!

Why Most Surround Headphones Aren't Really 7.1

One thing that's hard to tell is whether a set of headphones produces a 5.1 or 7.1 effect. The former is more popular, but even those that offer the latter are often emulating 7.1 sound from a 5.1 signal. Which leads to an obvious question: if 7.1 sound is full surround, why do headphones stop at 5.1?

The answer is simple: there just isn't the support for it. While many movies are mixed with full 7.1 sound, it's much less common in games. Surround headphones tend to be aimed at gamers, rather than movie enthusiasts, so it's simply not cost effective for manufacturers to add the extra support at the high end. Indeed, older consoles, such as the Xbox 360 (and the games of that era) don't even support output greater than 5.1, so you can't use it even if you have the hardware necessary.

It's not out of the question for a headphone set to true 7.1 outputs, but it is far less likely at the low end. Even if the headset has a 7.1 output, you also have to make sure your audio signal is 7.1 so you can use it, which requires a decent sound card. So in a way, it's good news that you don't need to pay extra for 7.1, because it's just throwing money away. However, if you do want 7.1, make sure you check what you're buying first.

“ It's worth noting that surround sound headphones tend to offer a lower-quality sound than similarly-priced stereo headphones ”

Alternatives

Buying surround headphones isn't the only way to experience surround-sound, of course. There's always the option of buying a surround speaker system, assuming you have the relevant audio outputs on your PC's backpanel (most desktop systems should support it, but you may need an external sound card on laptops).

Another alternative is to convert your existing headphones into a pair of surround headphones. This is a good way to avoid the quality drop associated with low- and mid-price surround headphones. Adding true surround is impossible, because it requires extra drivers in the headphone itself, but normal stereo headphones can be converted into virtual surround versions through the addition of a preamplifier or a sound card that includes the necessary processing capability.

This has a number of other benefits, not least the fact that you can re-use the hardware with any future pairs of headphones. While it may make the initial outlay more expensive, it should save money in the long term, though it is admittedly not as compact or as simple a solution as buying headphones with virtual surround built-in.

There's also a fairly compelling argument against bothering with surround headphones at all, which states that since most people only have two ears, 'true' surround is theoretically no better than good virtual surround. Ultimately the sound is going into your left or right ear, and especially with headphones there should be no obstacle to creation a positional effect using only two speakers – because that's how we do it in real life, after all!

Still, others claim that they can hear a difference. It's a phenomenon that not only resembles arguments concerning quite a lot of high-end audio equipment, but also between people who claim they can't see differences in game framerates higher than a certain amount, and those who think they can. Maybe you'll have to try for yourself to find out.

Buyer's Guide

Figuring the surround sound headset that is right for you means taking stock of a wide range of models at a wide variety of price points. Since most of these headphones are designed for gaming, they tend to incorporate a microphone, and land somewhere inside the 'industrial stealth' end of the design spectrum – but rest assured they're fine for watching movies with as well.

Budget: Corsair Raptor H5 Gaming (£30)

It's easy to find the Corsair Raptor H5 headset for well under its £30 RRP. That makes it cheap for a pair of headphones full stop, let alone surround sound ones. What's more, Corsair is a name with plenty of credibility for in terms of its gaming hardware, so how does the Raptor H5 fare?

Things start off quite well. The package includes a USB adaptor so you can use either dual analogue or USB connections, and the built-in audio processor simulates a 5.1 surround experience. This gives it a fairly good range of use – if you have a decent sound card with surround support it'll use that, and if you don't

> **"Normal stereo headphones can be converted into virtual surround versions through the addition of a preamplifier or a sound card"**

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it'll take care of that for you. There's a built-in noise cancelling microphone and in addition to volume control, you also get stereo balance so you can favour one driver over the other. The cable is an almost over-generous 5.2m in total – 2m on the headphones, a 1.2m in-line USB audio extension, and another 2m extension cable.

The H5 is an update to the older H3 headset, and like its predecessor it's a surprisingly good performer for its price range, though we admit that's not hugely inspiring praise. If you want to go a little better, the Corsair Raptor HS40 costs only a little more and supports virtual 7.1 output, so it may be worth considering. If you're on a tight budget, though, we doubt you can do better than this!

Mid-Price: Logitech G35 Gaming (£90)
The quality of Logitech's hardware can be inconsistent, but few would say that its ever less than adequate – especially when it comes to the higher-end G-series of gaming peripherals. As these G35s cost £90, adequate alone isn't anough, though – so it's lucky that they seem to be punching at, if not slightly above, their weight as far as surround headphones are concerned.

Although they offer virtual rather than true surround sound, the G35 headphones are fully compatible with Dolby 7.1. In addition, they have three programmable keys that can help you toggle signal-to-noise ratios, activate and deactivate in-game features (like background music) or offer instant voice morphing. There's a 3m integrated cable, a retractable microphone, and an indicator LED to show when the mic is muted. Helpfully, the headband comes with three different sleeves so you can pick the one most suited to your head size and shape.

As you may have guessed, the features require a USB connection. So, anyone hoping to get analogue sound is going to be disappointed. That does leave an audio jack free on your system, but if you have a high-end gold plated sound card it's probably not going to be much comfort. That alone makes it tough to recommend to true audiophones, but if you're just a gamer out for decent sound rather than trying to make sure you hear every frequency in an orchestra, it'll probably be enough. The sound quality is good, and the software even gives you notice of when the last genuine surround sound stream was used, so you can check whether you're actually getting one.

> **"However you feel about surround sound, it's easy to see that these headphones was built with a good audio experience in mind"**

High-end: Razer Tiamat 7.1 Elite PC (£170)
Costing the best part of £200, the Razer Tiamat 7.1 is about as high-end as a pair of headphones gets in this market. If you're looking for a pair of headphones with true surround, which means multiple drivers, this has it (no fewer than 10 drives, in fact), as well as a separate volume unit allowing you to set the volume, audio positioning and bass depth independently so you can lower or raise the positional sensitivity from full surround down to simple, non-positional stereo.

However you feel about surround sound, it's easy to see that this pair of headphones was built with a good audio experience in mind. Because it's true surround, you'll need to make sure you have outputs for the front, rear, centre and subwoofer speakers, and the volume unit requires a spare USB port. The cable is braided for strength and a comfortably long 3m, and the headphones themselves weight 350g in total. As a headset it does, of course, include a built-in microphone.

There's no doubt that this is a great set of headphones, and while it's not as good as an actual surround system it's hard to argue against it being the next best thing. If you think true surround is worth paying extra for in the first place, you should be rewarded by these headphones. If you're on the fence, we can't help thinking that the price is just going to put you off. In terms of disadvantages of the actual hardware, the only case we can make against it is that the volume control is absolutely monstrous. Other than that, there's little else you could ask for. **mm**

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A fresh take on technology

How Vulnerable Is Your Home To Hackers?

More and more everyday devices can connect to the internet. While there are advantages to that, there might be some serious safety issues involved, too. Sarah Dobbs takes a look...

The idea of 'the Internet of Things' is a pretty exciting one. Forget the jibes about internet fridges that never quite took off – now we're looking at a world where you can control your central heating and even the colour of the lighting in your living room from your smartphone via internet-connected devices, should you so choose. Almost anything and everything comes with an internet connection nowadays, and the days of only being able to go online from a landline-connected PC in one corner seem like a million years ago.

We're not living in a perfect tech utopia yet, though. While there are plenty of benefits to linking up your various devices to the internet, there are also some pretty serious problems, too. Any device that's hooked up to the internet is at risk from malware and cyber criminals and, while we all know how we should protect our computers from those threats, it's not always obvious that your new shiny device needs to be protected. How do you install anti-virus protection on your boiler, anyway?

As the Internet of Things has become less of a snappy buzz-phrase and more of an everyday reality, we've started to see exactly how vulnerable it might be. So how worried should we be? Perhaps more importantly, how worried should manufacturers of wi-fi enabled gadgets be?

Trouble Ahead

One of the first examples of how some internet 'things' are easily exploitable was a silly prank. Someone noticed that they could see their neighbour's wireless printer on their network, and sent a message to it. Half a dozen other people followed suit, some turning to Reddit or Tumblr to ask what they should send; sensibly, things that sounded like bomb threats were discouraged in favour of more absurdist documents, like an essay consisting only of the word "chicken", repeated hundreds of times. No harm, no foul (or fowl), and the neighbour presumably got a quick lesson on why network security is important.

That prank serves to highlight such vulnerabilities, and there would be more to come. This year's DefCon hacking conference held a competition that invited attendees to demonstrate exactly how secure internet-connected objects were in a designated "IoT Village", and the results were scary. Hackers managed to remotely mess with smart scales, smart thermostats, baby monitors, and yes, smart fridges.

The most frightening hack of all, though, came when a pair of security researchers demonstrated that it's possible to remotely access the on-board entertainment systems of certain Jeep models and take over the car's functions, Including acceleration and braking. Journalist Andy Greenberg was behind the wheel when the hackers Charlie Miller and Chris Valasek took control, first changing the radio station he was listening to and switching on the air conditioning, then turning on his windscreen wipers, and finally immobilising the car altogether.

Chilling, no? The hackers were able to get into the car's systems through its Uconnect feature, which is set up to enable internet access and navigation in over a million Chrysler (Jeep's parent company) cars and trucks. Chrysler responded to the hack by issuing a safety recall on affected models, and installing software updates to patch the vulnerability that made the hack possible, but it's still a frightening idea. After all, shouldn't safety be a bigger concern than whether passengers can check Twitter on the go?

Serious Insecurity

Unfortunately, Chrysler isn't the only company facing a headache over security issues. Last year, researchers working at Hewlett-Packard carried out a study into the Internet of Things. Through thorough analysis of a series of different devices – including televisions, sprinkler controllers, home alarm systems, and device hubs, all of which could be controlled using mobile apps – they found that 70% of the devices used unencrypted network connections, and 60% had insecure web interfaces.

Since almost all of them also collected and stored personal information about their owners, the idea that a hacker might be able to remotely turn your sprinklers off suddenly becomes even more menacing. When the devices in question could potentially be part of a home

Careful Where You Point That Thing

As if a world where cars and front doors can be remotely controlled by hackers wasn't a scary enough prospect, we might also have to worry about hackable guns. Yup, computer-assisted rifles exist, and they've been hacked.

Security researchers Runa Sandvik and Michael Auger demonstrated their terrifying work at the DefCon and Black Hat conferences. The TP750 sniper rifle has a wi-fi access point and a computer-guided system that, alongside the kind of ammunition loaded into it, is designed to make it incredibly accurate by taking into account wind and weather conditions. However, as Sandvik and Auger showed, it also makes it vulnerable to outside influence.

Here's the bit that makes it less terrifying: in order to access the gun's computer systems, they had to be within 100 feet of it, and while they were able to change the gun's target and even prevent it from firing, they couldn't make it fire itself. So hackers would need to be close by, and wouldn't be able to cause the gun to shoot someone without the owner pulling the trigger. Still not sure we'll sleep soundly tonight, though.

security system, it all starts to seem like a really, really big problem.

That's not the only study to come to some worrying conclusions, either. Veracode, a security company specialising in cloud-based apps, also carried out some research into internet-connected devices, and found some serious security holes. Examining six different popular devices, Veracode found that five of them didn't require strong passwords from users, making them vulnerable at the most basic level to would-be hackers. Five of them were also vulnerable to man-in-the-middle style attacks, where hackers could intercept data transmitted between the device itself and its online service – and three of them didn't secure the most sensitive data they collected.

It's all pretty shocking, really. We've come to expect that the online services we use will safeguard our data, and when there's a breach it can have serious consequences – think back to 2012's scandal over Dropbox's insecurities, or eBay's data breach last year that saw the service face a massive class action suit. The Internet of Things is in its infancy, but experts reckon that by 2020, there'll be 25 billion internet-connected devices in use around the world. Should it turn out that 90% of them aren't secured properly, we have a serious problem.

"Examining six different popular devices, Veracode found that five of them didn't require strong passwords from users"

Specifically Speaking

Using a catch-all term like "the Internet of Things isn't very secure" doesn't really convey what the issues might be. There are some very specific risks associated with internet-connected devices that might never cross your mind, so it's time to get paranoid.

Some smart televisions, for example, have already come under fire for their ability to listen in on your home life. Anything voice-activated obviously needs to come with microphones installed, and most voice-controlled gadgets transmit their recordings to a server to be processed and recognised. We've talked about that in this magazine before, amid fears that companies were using those recordings to invade our privacy. Though that might not be a major concern, there's something else that might be – if recordings from smart TVs, or games consoles, or other voice-controlled devices like the Ubi can be accessed by criminals, they can be used not only to eavesdrop on victims' opinions on *Breaking Bad*, but also to figure out lifestyle patterns. That could, conceivably, help burglars find the most opportune time to break in.

Gate and garage opening systems might carry similar risks. For starters, most of them use very simple access codes, which can be cracked by hackers within seconds. Last year, hacking consultant Samy Kamkar demonstrated how he'd used a modified child's wireless gizmo to open the door to the garage in his apartment building, and those of several of his friends. The wireless openers gave

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an illusion of security that turned out to be about as secure as leaving the key in the door. What's more, on top of being able to walk straight in through the garage, hackers have been able to intercept data sent back and forth between remote-access garage and gate doors and the apps that use them. That means, yet again, they can figure out when no-one's home.

As well as exploiting the devices' own functions, there's another obvious evil thing malicious types can do with internet enabled white goods: recruit them into botnets. Just as your PC can be used without your knowledge to send out spam emails, so too can your internet fridge. One example of that happening is already on record – back in December 2013, hackers managed to create a botnet that included at least one internet-enabled fridge and used it to send out phishing emails. If it's happened once, you can bet it'll happen again.

Send In The Drones

Ready to feel seriously scared? A team of security engineers at Praetorian recently devised a way of mapping out all the smart devices in their city – by flying a drone over it. The drone carried a tracking device set up to sniff out ZigBee signals; not all internet-connected devices use ZigBee protocols, but a lot of Internet of Things-style devices do, and during one 18-minute flight over the city of Austin, Texas, the drone had found almost 1,600 such devices. The team at Praetorian also devised a kind of fingerprinting method that let them work out what each device was, or at least who its manufacturer was, and stuck all that info on an online map.

Hairs on your neck standing up yet? What if we tell you that ZigBee has been found to have some vulnerabilities, and those could potentially be exploited to let hackers take control of all the devices on a ZigBee network – from thermostats to alarm systems to door locks?

beyond the control of the end user. The only way to get they will get fixed is via updates by manufacturers. However, as the studies keep showing, nowhere near enough is being done to test and secure devices before they're put on the market.

What does that mean for the Internet of Things? Well, sadly it looks like we all need to be careful before jumping in feet first. Though some web-enabled devices seem like the answer to all our problems, they might end up causing more issues than they solve. For now, our best advice is to do your research before handing over your cash to join this brave new world – we need to demand more thorough testing and responsibility taking from manufacturers before we commit to their latest technology, and that could mean voting with our wallets. **mm**

> **"As studies keep showing, nowhere near enough is being done to test and secure devices before they're put on the market"**

We've got a final bit of bad news before we leave you to ponder the pros and cons of all this, too. While there are some things users can do to secure their devices against external threats, like setting strong passwords, most of the currently known vulnerabilities are totally

Who's Watching You?

The whole point of wi-fi enabled security or 'nanny' cams is to make family members feel safer. Installing one means parents can check in on their kids wherever they are, whether they're in the office or in another country. But – well, you can probably guess what the problem is. Some of these cameras have been found to be vulnerable to hackers, meaning that someone other than a doting parent can take a peek at what's going on in the owners' home.

The vulnerability was discovered when a family in Rochester, Minnesota, heard creepy music playing through their nanny cam. The music stopped when someone went into the room, and when they investigated they found a website containing images from thousands of similar cameras all over the world.

If you've got a streaming camera set up in your home, you don't necessarily have to put tape over the lens just yet, but it's worth taking some precautions. Make sure the camera's firmware is up to date and that you're using the most recent version of the software with it, since manufacturers will usually patch any vulnerabilities when they become aware of them. Also make sure you've got the biggest weakness covered – for heaven's sake don't use the default password! Make sure you change it to something longer and stronger as soon as you set up your device.

'With moments of real genius, some of his poems will last as long as poetry is read.'

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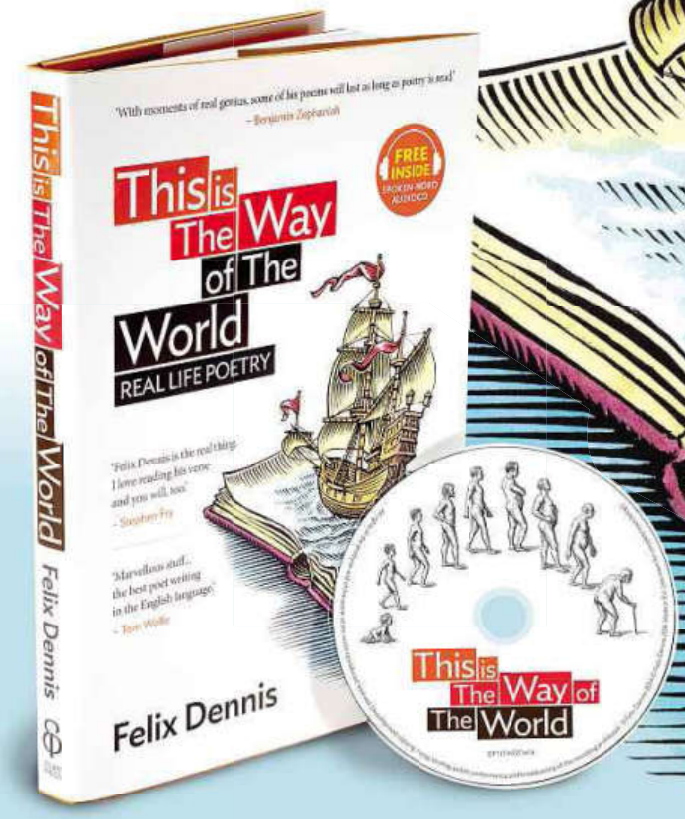

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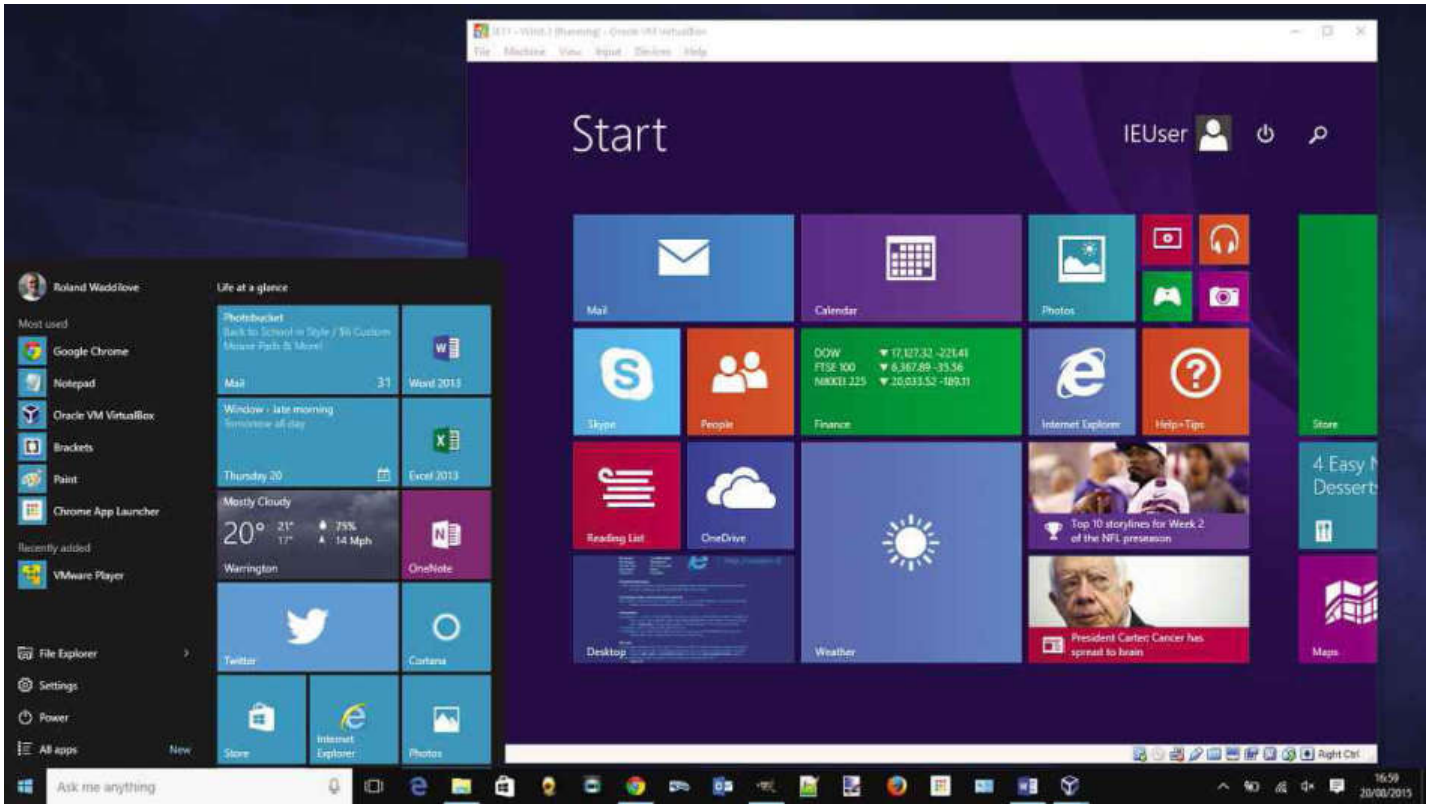


Download Any Version Of Windows Legally For Free

Want to run a different version of Windows? Roland Waddilove shows where to get it and how to install it

You may not have realised it, but Microsoft is giving away free copies of all versions of Windows from XP right up to Windows 10 and everything between. You can download Vista and see if it really was as bad as people say it was, check out the latest Windows 10 improvements or continue to run Windows 7 even after upgrading to Windows 8 or 10.

Free Windows? If you are thinking that there must surely be a catch, then you're right. This is not quite the giveaway of the decade, but it's still very good and is very useful for certain tasks you might want to perform with older or newer versions of Windows than the one that's currently installed on your computer.

The free versions of Windows are virtual machines, which means they can't be installed on a real PC, but they can be run using software like VirtualBox, VMware Player and similar applications. This means you can run Windows 7 in a window on your desktop in Windows 10, Windows 10 in Windows 7, XP in Windows 8 and so on. Virtual machines can be run full screen, which hides the host operating system, and it looks and feels like you're running the guest operating system on your computer.

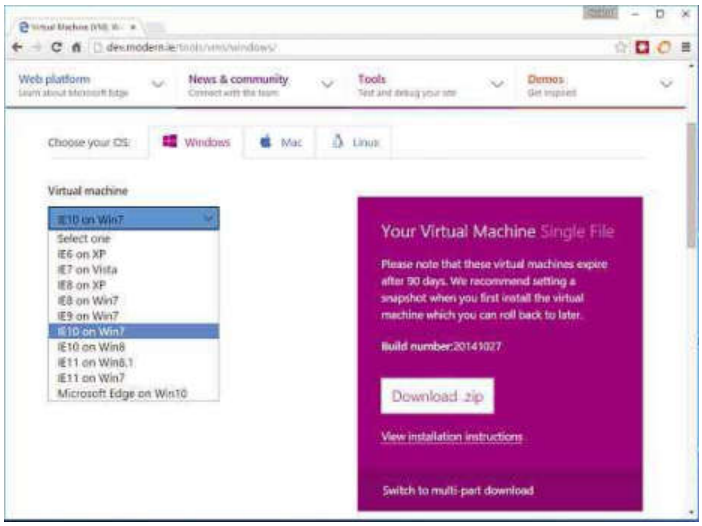
A virtual machine, if you haven't tried one before, is a bit like an emulator of hardware such as the Gameboy, Sinclair Spectrum, Commodore 64, Atari and others. It does more than emulate the hardware, but the result is the same, and you get a sort of simulated PC in a window on the desktop or running full screen.

Virtual machines run in Linux too, so if you have Ubuntu or some other Linux distro running on your PC and want to try Windows 10 to see what it's like or to run essential programs not available on Linux, then this is a great way to do it.

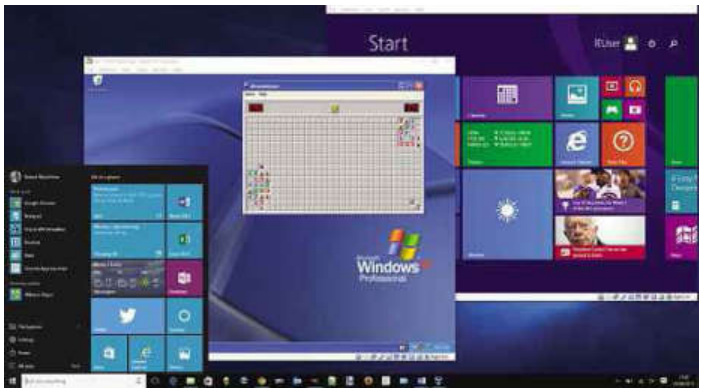
So why is Microsoft giving away virtual machines containing Windows? They're aimed at web developers who want to ensure their websites work with older versions of Internet Explorer. Each virtual machine has a different combination of Windows and Internet Explorer, so there are two copies of Windows XP, because it originally shipped with IE6, but it could be upgraded to IE8. You can download either or both versions of XP to get access to the browser you want.

Windows 7 came with Internet Explorer 8, but it could be upgraded to IE9, 10 and 11. Consequently there are four copies of Windows 7, one for each version of IE that could be installed. There's Windows 8 with IE10, and 8.1 with IE11 and Edge, which is the replacement for Internet Explorer on Windows 10.

These virtual machines are fully working, and they're not limited to running Internet Explorer. You can download and install any software



Pick the version of Windows you would like to run in a virtual machine



Windows XP Pro and Windows 8.1 virtual machines running in Windows 10

you like, because Windows runs like it would on a normal PC actually installed on the hard disk drive. This makes these virtual machines great for testing software before you actually install it for real on your main computer. It's like having a test PC at your disposal, and you can try out software without the risks that are associated with testing a program on your main or only computer.

VirtualBox will be used in the example here, but VMware Player is very similar.

Install Windows Into VirtualBox

If you don't have VirtualBox running on your computer, fire up a web browser, go to **virtualbox.org** and download it. This is a free program and is required to run the virtual machine we will download.

After installing VirtualBox, go to **dev.modern.ie/tools/vms/windows** and select the version of Windows and Internet Explorer or Edge you want in the Virtual Machines list. There are ten different ones to choose from. Then click the Select Platform list and choose VirtualBox. There are different virtual machine file formats, so you need the one that matches the software you have.

These virtual machines are big. The smallest is over a gigabyte, and the largest is nearly 5GB. A fast internet connection is therefore best, and with fibre optic you can grab even the biggest virtual machine in 15 minutes or so. If you have a slow internet connection, there's an option for a multi-part download (several smaller files), or you could use a download manager (they still have their uses). Avoid downloading at peak times of the day (the evening), and take care if you have internet data limits.

Unzip the file after downloading it, and the result is a file with a name like IE11-Win8.1.ova or IE8-WinXP.ova, depending on the version of Windows and Internet Explorer you selected. Start VirtualBox, go to the File menu and select Import appliance. This is how ready-made virtual machines downloaded from the internet are added to the software. Browse the disk and select the file that was extracted from the downloaded zip file.

The Windows virtual machine is ready to use, but Microsoft has preconfigured it with a specification that was typical at the time. If you have Windows XP for example, it comes preconfigured with just 512MB of memory, one CPU, minimal video memory and so on. Select the virtual machine in the list in VirtualBox and click the Settings button to view and customise the simulated hardware.

Select General in Settings and the Advanced tab on the right. Set Shared Clipboard to Bidirectional. This means that you can copy text and images in the host operating system, Windows or Linux, and paste it into the guest OS or copy stuff out. Select the System category and the Motherboard tab on the right. Increasing the amount of memory given to the guest OS enables it to run better. Set XP to 1GB and Vista and above to 2GB. Bear in mind that this reduces the memory available to the host OS, so don't give it more than half the RAM in the PC.

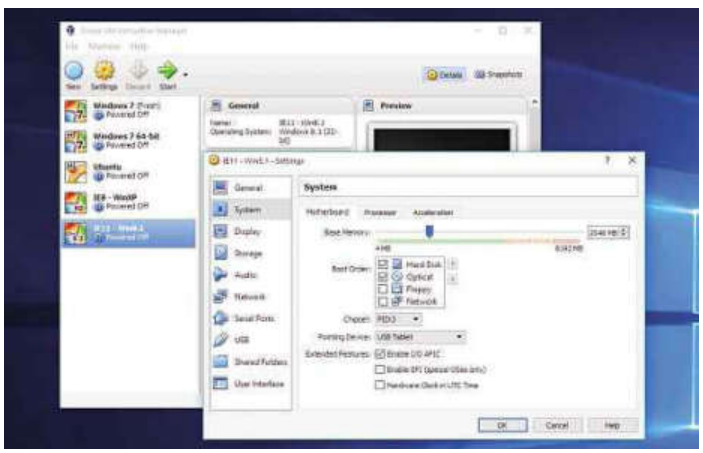
Select the Processor tab and you can assign CPUs (real and virtual), and for best performance you should assign two. Select Display, then the Screen tab and increase the video memory slider to the maximum. Having more video RAM boosts the performance.

Now you're ready to select the virtual machine and click the Start button. The copy of Windows then runs in a window on the desktop, and it can be used just like the real thing. Hold down the right Ctrl key and press F to run the guest OS full screen.

What's The Catch?

Apart from being virtual machines rather than the original installation disc, there's another catch, which is that these versions of Windows are time limited. You basically get the trial version, and they run for up to 90 days, then stop working. However, you can delete the virtual machine and install a fresh copy from the downloaded file and get another 90 days use, repeating this forever. You would lose any settings or software you installed, but as it's used only for test purposes, it doesn't matter.

Some versions only run for 30 days, but there's a trick to make them run for longer. Right-click Command Prompt in the Start menu and select Run as administrator. In XP, enter 'rundll32.exe syssetup,SetupOobeBnk" and in Vista, 7 enter 'slmgr /rearm'. This resets the timer back to zero to give you another 30 days. It can be used once more for another 30 days use. After 90 days, delete the virtual machine and import it again. **mm**



Before starting the virtual machine, go into settings and increase the RAM and CPUs

Thunderbolts & Lightning!

Very, very frightening... If you're Google

Birthday Flight For Colossus Operator

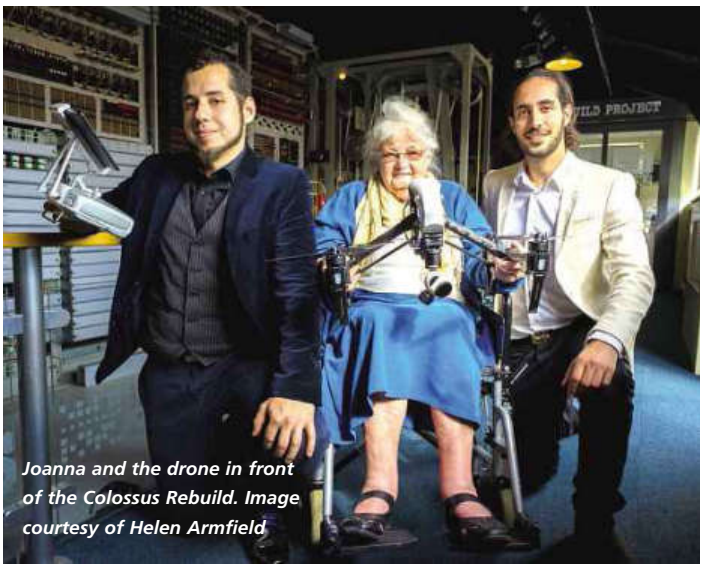
Wartime worker revisits workplace in drone take-off

What do you think you'll be getting up to on your 90th birthday? For us? Cake, drink and a Zimmer frame will likely come into play somewhere down the line. Joanna Chorley, however, took a drone helicopter to the skies in a supremely genius celebration of her own big day.

Joanna was an operator of Colossus, the world's first electronic computer way, way back in the day and just a few days before her birthday she returned to Bletchley Park during one of the many pop-up events that took place at The National Museum of Computing's Summer Bytes festival. Through the drone's on-board camera, she and other visitors had a fabulous aerial view of Bletchley.

Joanna enjoyed herself, saying: "I haven't had so much fun in years. I loved every single moment operating the drone and my mind was racing thinking of all the applications that the technology could be put to." You can see the footage for yourself on YouTube and the drone got up some speed on its journey, flying at up to its legal speed limit of 50mph and at a height of around 50 to 100 metres.

The festival is over now but anything that finds a good use for drones is OK by us.



Joanna and the drone in front of the Colossus Rebuild. Image courtesy of Helen Armfield

QUICK BITS... Happy belated Birthday to Windows 95, which was launched on August 24th, 1995

One of Google's mighty European datacentres has suffered a permanent data loss following a lightning storm. Four separate lightning strikes to a nearby power grid disrupted the datacentre's power and resulted in a bunch of I/O errors being returned, ultimately leading to the information concerned disappearing for ever.

Relatively speaking, it's not much data; Google has said that under 0.000001% of everything it holds was actually lost as a result of this. However, as Google's data banks are pretty hefty in reality, that's likely to be a fair chunk of information nonetheless.

In reaction to this event, Google has apparently said that it's working on an upgrade program in order to improve cache data retention in the event of power issues in future.

Google

For a while now, I've had Virgin Media's top broadband connection, which gives me download speeds of up to 152Mbps. Most of the time, I get that speed too, except when I use my PC upstairs.

Because the router is on the lower floor, I have to rely on either wi-fi or a Homeplug adapter, neither of which gives me the full speed of the broadband. But if I connect with my laptop in the same room as the router, then the speed is the same as if I were connected via Ethernet.

Clearly, then, range is a problem for the faster wi-fi standards, and the electrical wiring in my house simply wasn't designed for carrying data. What would be, of course, is Ethernet cables running through the building, allowing me a hardwired connection in any room. It's a possibility, but hard work.

Ideally, I'd like a faster wireless standard, with not only longer range but also greater speed. For now, though, I guess I'll just have to stick with moving closer to the router.

Anthony

Editor

Flash! Ah-Ah!

Have we done that joke before? Oh, well... Meet Samsung's new drives

Samsung has grown its product line with the introduction of a new suite of slim and sophisticated USB flash drives, all featuring Samsung NAND flash tech.

Samsung's 3.0 flash drives come in three different form factors, bar type as well as FIT and DUO. The bar type comes in high-quality metal casing for extra durability and it's available for PC use in three capacities – 16GB, 32GB and 64GB. Offering sequential read speeds of up to 130MB/s, this means users can download a 2.4GB full HD video or around 40 hours of music to their device in under 20 seconds.

The FIT drive for ultra-slim notebooks offers sequential read speeds of up to 130MB/s in 32GB and 64GB capacities. Finally, the DUO is for mobile devices and comes with a protective cap for the micro USB port. This also has a sequential read speed of up to 130MB/s, comes in 32GB and 64GB capacities and is compatible with Android devices with a micro USB 2.0 interface.

It's www.samsung.com for more details, then.

Meanwhile... On The Internet...

Some very big, Dark Web sites have come and gone in recent years. There have been the well documented falls of The Silk Road and Silk Road II, courtesy of the US Federal Bureau of Investigations (or the NSA, depending on who you believe) and the dodgy disapearance what had initially seemed to be their natural successor, Evolution – along with all of its users Bitcoins. Now, it would seem, another online drugs market is on its way out, but for very different reasons.

The people behind the Agora marketplace, which had taken the number one spot in the absence of Evolution *et al*, took to Reddit's r/darknetmarkets subreddit and other locations last week to explain to its users and interested parties that it was taking itself offline indefinitely (**tinyurl.com/MMnet78a/**). In contrast to the theft perpetrated by those running Evolution, it would seem that Agora's team is keen to keep its users up to date as to the exactly why it's taking the step.

Its announcement (**tinyurl.com/MMnet78b/**) stated that recently exposed weaknesses in the Tor protocol, along with "suspicious activity around our servers" has led it to the conclusion that "attacks described in the research could be going on" and that while it has a solution, it will require "big changes into our software stack" and the time offline.

Apparently, the downtime could lead to delays in payouts as Bitcoins are withdrawn en masse, and the cancellation of orders not sent out or processed yet, but the site's statement promises that all user history and profile data will be preserved during its attempts at self-preservation, and to avoid the fate that befell the Silk Roads when it failed to get on top of its security.

The shocking murder of TV reporter Alison Parker and cameraman Adam Ward that made for some particularly harrowing and frankly distasteful (in our opinion) newspaper front pages last week has led to some interesting debate about the workings of social networks. Specifically, it's called into question the implementation of autoplay features for video in Facebook and Twitter, which led to many people seeing the horror play out from a first-person perspective (tinyurl.com/MMnet78i).

There seems to be little or no contingency for dealing with a person willing to commit such a crime, record their heinous actions on what appeared to be a GoPro-style camera and then immediately take to social media in order to further his agenda and share the footage. The decision of social networks to implement autoplay to increase the exposure of advertisements and viral posts means that many more people are going to be exposed to the footage than would have been the case had the feature not been active, or deactivated in any given user's settings (tinyurl.com/MMnet78j), which it can be (tinyurl.com/MMnet78k). Of course, there's another discussion to be had about the people who actually saw fit to share that video with people they may call friends. However, people being people, it would seem that the big players in social media may now well be forced to rethink the relationship between what's good for their users and what's good for their bottom lines and shareholders (tinyurl.com/MMnet78l).

When you've spent a fair bit of time on social media, it's easy to become a bit cynical about the 'Please Share/Please Retweet' things you come across on your travels. Then, you come across a story like the one of Facebook user Denise O'Reilly, who came across a €20 note with what appeared to be a love note written on it (**tinyurl.com/MMnet78c**)...

She posted a picture of the note, which read "Christy, it's always been you! Come find me – Megan", and it was subsequently shared 15,000-odd times before it caught the attention of a chap called Christy Leech, for whom it had some meaning (**tinyurl.com/MMnet78d**). He told Irish radio station Hot FM that the note had been written for him by an ex-girlfriend, for whom he'd written a song called *It's Always Been You*, on a note she'd used to pay for entry to one of his shows (**tinyurl.com/MMnet78e**) around six months previously, but that he'd never seen it. He says the two are "now we're in touch again", but that the "situation is quite different"... So whether love will blossom is unsure, but awww, all the same, eh?

As the dust settles on the Ashley Madison hack, both for those affected (**tinyurl.com/MMnet78f**) and those culpable (**tinyurl.com/MMnet78g**), it's inevitable that the focus will shift to finding who actually did it (**tinyurl.com/MMnet78h**). The urgency of the search will almost certainly be increased by the decision of Ashley Madison's parent company to offer $500,000 Canadian to anyone giving it information that leads to the apprehension of the group or individual behind the Impact Team, which has claimed responsibility.

.AVWhy?

Videos For Your Eyes... Not Necessarily For Your Brain

While every geeky fibre in our body wants to hand the AVWhy picture to the wonderfully awkward footage of a lavender-suited Ash (known to a small section of the world as Bruce Campbell) taking over a Chicago TV weather report (**tinyurl.com/MMnet78m**), another kind of beauty can be found in this footage of Nasa's Landing and Impact Research Facility. Especially fun is the timelapse of the massive pond it built in order to splash test capsule designs (**tinyurl.com/MMnet78n**) in a realistic way. What a great job that must be...

QUICK BITS... Amazon has banned Flash advertising from September to try to plug up associated security problems

Caption Competition

This rather futile effort at transportation was the subject for our caption competition in issue 1376. Here's the best suggestions that made their way to us...

- **Martin Prince:** "The concept of a Dryathlon was lost on Tony."
- **Ondrive:** "Apple's team of designers launch another solution looking for a problem."
- **Wudger:** "At least I have a paddle and this isn't a barbed wire canoe."
- **Narco-Polo:** "Arthur was all ready for his course on getting the most out of C."
- **Thomas Turnbull: "**My laptop overheated and fell out the dinghy now look what's happened."
- **Thomas Turnbull:** "My thirst for knowledge has gone a bit to far this time."
- **Nigel Hills:** "When the Windows 10 install hits you with... 'Something Happened'!"
- **Half-a-daily:** "Well, this creek certainly fits the bill... But at least I'm up it WITH a paddle."
- **Peter Jacoby:** "No one at Google told Jeremy that Wave had been shut down years ago..."
-

The winner's gong, however, goes to the simple beauty of Wudger's "!$%#ing satnav!"... A sentiment I think we have all voiced at some point, and which is admirable for both its levity and brevity. However, if you think you could have done better, head over to the 'Other Stuff' section of our forum (**forum.micromart.co.uk**) and say something funny (but not too rude) about the picture below – or email us via **caption@micromart.co.uk**.

Cobbler Cops Hammering Downloaders

US lawyers allege that up to 11 people actually wanted to see an Adam Sandler film

Eleven users of a BitTorrent-based app Popcorn Time, which allows for easy downloading of pirated content, are facing a civil suit in America.

Specifically, the anonymous Comcast customers are accused of using it to watch Adam Sandler flick *The Cobbler*, violating copyright laws as they did so – and the boundaries of good taste, if reviews of the film are right.

The filing says "Popcorn Time exists for one purpose... to steal copyrighted content", which is probably true. Whether the legal eagles behind this can prove who did what with only IP addresses as evidence, is more in doubt.

Cut Fast With Fastcut

Video editing package from Magix

Magix's new Fastcut app promises simple, fast video editing for Android devices and as it's completely free, there seems little reason not to try this out.

The idea behind the app is that many of our most memorable moments need capturing in an instant and Fastcut works by using video clips to automatically create dynamic short films right onto a smartphone or tablet. It comes with a wide range of themed templates with transitions and specially-produced music and it also allows users to quickly and automatically arrange footage to match the beat of the music.

Individual clips can be rearranged or automatically reshuffled and finished results can be exported in all resolutions up to Full HD. From there, upload to Instagram, YouTube, WhatsApp, Facebook – you know the drill.

Available to download for free in the Google Play Store right now, you can also purchase additional templates and features for 89p a month. For info on this and other Magix stuff, you should go to **www.magix.com**.

Snippets!

Printed Hand Wins

The annual James Dyson Award has crowned the creator of a 3D printing project this year's winner. The project from Open Bionics, run by a recent University graduate, created a prototype 3D-printed robotic hand that can be made for far cheaper than typical robotic hands within days.

These things usually take much longer to get you hands on (sorry) so this is a bit of a coup for the creator. The guy behind it is a mere 25-years-old, which is embarrassing for us as we were still playing around on Sensible Soccer when we were 25. Mind you, we still are now. Sigh

Hawking's Voice Online

The software that helps Professor Stephen Hawking speak via a computer system has now been published online by Intel. Intel developed the Assistive Context-Aware Toolkit (ACAT) technology, which translates visual signals into words, as an upgrade for Professor Hawking – but if you want to play around with the software yourself, you now can as the source code is over at GitHub. This is really one for the developers amongst you, though.

Android Wear Faces Up

Google has now announced an update to Android Wear that adds interactive watch face support so developers can write apps with customised layouts and buttons to reveal information. The kind of functionality this can bring could be things like seeing appointments, unread emails, the weather – all direct from the watch face. Expect this to be rolled out to all applicable devices over the coming weeks.

Spotify Says Sorry For Policy

Update leaves users angry

The head of Spotify, Daniel Ek (in case you were wondering), has said sorry after users became angry over the service's updated privacy policy. Some users, including influential *Minecraft* creator Markus 'Notch' Persson, had gone as far as saying that they were leaving the service altogether following the release of revised T&Cs, which outlined the firm's desire to access pictures, contact details and sensor data from users' smartphones.

Ek has since spoken out to clarify things in a blog post, apologising for any "confusion" that these changes caused, adding that it "should have done a better job in communicating what these policies mean and how any information you choose to share will – and will not – be used."

Apparently, Spotify has no plans to access or import data overt permission, although it's worth noting that many smartphone users don't always fully understand how permissions work. However, with 75 million active users, Spotify has got plenty of goodwill in the bank. Shame that this latest incident has damaged that a little.

Google Unveils Smart Hub

OnHub promises 'new way to WiFi'

What, really, is "a new way to Wi-Fi"? We have no idea but those clever marketing bods over at Google must do, as it says so right on the press release for its new router. Partnering with TP-Link, the firm's new OnHub device is a cylindrical router that can be controlled via an app with Google also promising frequent automatic software updates. We're not sure when it's coming to the UK as it's going to launch across the pond first.

Supporting 802.11 a/b/g/n/ac and Bluetooth 4.0, OnHub also supports smart home protocols such as Android's Weave. Compatible with 2.4GHz and 5GHz wi-fi, the router's specification is a dual-core 1.4GHz Qualcomm Atheros IPQ8064 with 1GB RAM and 4GB flash storage. Hey, there's even a speaker alongside just one USB 3.0 port and LAN/WAN ports. Looks nice, doesn't it?

QUICK BITS... Apple has recalled a number of iPhone 6 Plus phones because of complaints over a

Drone Dump Results In Arrest

America always has the strangest stories

The Associated Press has recently reported on the arrest of a pair of gentlemen who were discovered to be attempting to use a drone to fly drugs, tobacco and pornography into a maximum-security prison in Maryland.

Apparently, this kind of thing is becoming a bigger and bigger issue for law enforcement and these particular chaps were stopped on the highway nearby the prison. A search of the vehicle found the various aforementioned goods alongside a handgun and in an attempt to stop this practice from happening in the future, the secretary of the Maryland Department of Public Safety and Correctional Services was quoted as saying that he was going to ask for funding for drone detection equipment going forward.

"You can't make this stuff up," he was also quoted as saying. Well, you could... But.

Laser 'Downs' Chopper

But Canadian police always get their man

Most of us have become used to the idea that it's not wise to point lasers at aircraft or other vehicles. Many will have read warnings regarding the potentially dangerous effects of the distraction or 'flash blinding' that can happen if you do... But not everyone, it would seem, for a police helicopter in Ontario was forced to make an emergency landing when it appeared to be targetted by a laser beam from the ground.

The officers piloting the chopper were being especially careful as they were responding to a weapons-related call, and the person that was pointing the laser also appeared to be armed. However, after a ground-based chase through nearby woods it transpired he was only carrying an air gun with a laser sight. Stupid, stupid man.

Ashley Madison Lawsuit Launched In Canada

Multi-million dollar suit following data breach

A couple of law firms in Canada have slapped the now world-famous (for all the wrong reasons) adultery website Ashley Madison with a joint £367m lawsuit in the ongoing fallout from the recent, seemingly comprehensive, hack and data loss.

The breach, which you will be all too aware of by now, meant that records from the 37 million users from the website were posted online and the two law firms in this case have filed a class action suit against parent company Avid Life Media "on behalf of all Canadians" who subscribed to the website and whose information was disclosed publicly.

> Steps should have been taken to ensure this data never got out

The law firms concerned have also said that this action has been brought about because steps should have been taken to ensure that this data never got out into the wild. You may have read that many customers of the site had apparently paid money to ensure a full deletion of data, only to find that certain aspects of their profiles were left on databases, exposing them like everyone else.

A separate class-action lawsuit has also been launched in America claiming for emotional distress as a result of the data breach, so we imagine that this story has a few more headlines left in it just yet.

dodgy iSight camera lens resulting in blurry photos

Code With AI2

Dice Shaker

Build an Android dice shaker app with David Briddock

Over the last few issues we've used App Inventor 2 (AI2) to build our first Android app, a useful timer.

In subsequent issues we'll build apps that explore particular aspects of AI2 coding. This time it's a random dice shaker app that's driven by a motion sensor.

Remember, all you need to play along is a Windows/Mac/Linux PC, web browser and Google account. Ideally you'll also have an Android smartphone or tablet for testing.

What We'll Learn

To test this particular app you'll need access to an Android device, as it uses one of its built-in sensors. The sensor in question is the accelerometer, which captures device movement and acceleration information. In this case we'll be looking for a shaking motion.

In addition, we'll use the Android device's text-to-speech capabilities to provide an audible indication of the dice number.

Starting AI2

In your browser, navigate to the AI2 home page (**ai2.appinventor.mit.edu**) and sign in with your Google account.

We need a new project, so in the Projects menu, select the 'Start new project' option and give it a meaningful name, such as 'MMDiceShaker'.

Screen Properties

We're automatically placed in Designer View mode. Notice there's already a component called 'Screen1'. We'll drag and drop the other components onto this screen.

With Screen1 selected, go over to the right-hand Properties panel. First, ensure the AppName is set to 'MMDiceShaker', then set the Title to 'MM Dice Shaker'.

Now change the AlignHorizontal property to 'center' with the spinner control, then do the same for the AlignVertical property. Next set the ScreenOrientation to 'Portrait'. An optional step is to change the BackgroundColor – say, to Blue as shown in the image.

Another optional step is to add an app icon image. Ideally this will be around 48x48 pixels in size, but any smallish image will do, as it's automatically rescaled. Click on the Icon property and select the 'Upload File...' button from the pop-up options. Select the 'Choose File' button, locate the desired image file on your PC and then click 'OK'.

Adding Components

Now for the screen components. We're going to display the dice number with a large font label in the centre of the screen.

In the left-hand Palette panel, open the User Interface group. Grab a Label component, then drag and drop it into

AI2 designer view

the Viewer panel coding area. Next, we need to fill the empty 'do' space to define what happens when a shaking motion event is detected.

The first task is to set the label text. Select the Label1 component and grab a green 'set Label1.Text' block. Drag this label over to the coding area and snap it into position inside the brown block.

We need to set the label text value to a randomly generated number between one and six. Open the Math group and select a blue 'random integer from' block. Snap this onto the end of the green block we just added. To set the random range between one and six, just click on the numbers and type in the new value.

Speak To Me

Now we'll add the text-to-speech behaviour. It's really an optional step, but definitely a fun thing to do. With AI2 we can create a text string and have the device speak the text back. Any text string will work.

Back in the Blocks panel, click on the TextToSpeech1 component and grab a purple 'call TextToSpeech1.Speak' block. It needs to be snapped into position directly underneath the green 'set Label1.Text' block.

Now we need a text string. From the Text group, grab a magenta 'join' block and snap it onto the end of the purple block. Notice there are two empty text values we need to set.

> **With AI2 we can create a text string and have the device speak the text back**

For the first value, grab a simple string from the Text group. Snap it into position then click on the space and type in 'It's a ' (or whatever text string you prefer). For the second value select the Label1 component, grab a light green 'Label1.Text' block and snap it into place.

And that's the coding done. Ensure the warning and error counts in the bottom-left corner are both zero, then carefully check your code against the Blocks View image.

Testing

To test this app, we can't use the Emulator, because it doesn't imitate an accelerometer shaking motion.

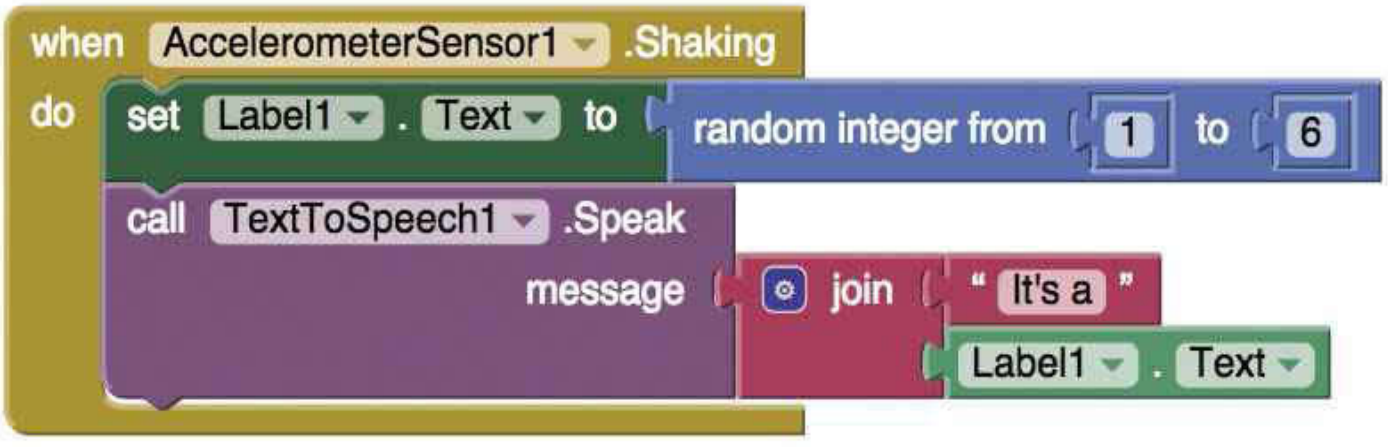
However, we can test with the AI Companion App installed on an Android device and the Connect menu's 'AI Companion' or 'USB' options (as we discussed earlier in the series).

Side-load the finished app onto an Android device (**goo.gl/ZMKgAe**), so it's within arms reach the next time you play a dice-based board game.

Going Further

There are many things you can do to enhance this app. One simple thing would be to adjust the background or text colours. A more adventurous exercise would be to have two dice labels, each having its own random number generation blocks.

Next time, we'll be building a fully functional web browser app. **mm**



AI2 blocks view

Your Letters

RE: MM1373 Windows 10

I'm grateful to Mark P for his most effective warning off of 'doze 10. He's validated my decision to stick to XP plus third party bits (quarantined off the outside world) for all my useful stuff as, stripped to the bone it's fast and everything is easy to find, though I do still miss my old Amiga when I have a lot of bulk processing to do – Microsoft missed a trick not installing a decent inter-process programming language. I use 7 Pro 64 where I must talk to the outside and now I've cleared away a lot of slow-you-down pretty-pretty rubbish and found out where they hid most of the useful bits it's not all that bad (if I'm not in a hurry) and does let me use 3TB and 4TB drives for my data without a lot of fiddling.

Ken West Walmer

Scammers Alert

Looks like the customer data leak from Talk Talk is continuing to cause problems.

A friend got a phone call from someone claiming to work for 'GRS Technical Services' on behalf of TalkTalk. The general gist was something to do with a router problem and lots of spam emails emanating from my friend's router(!). My friend has been having trouble with his router and a two-hour telephone conversation ensued and ended with him giving the scammers access to his computer via Teamviewer and handing over his card details. Thankfully, a stop has been put on all card transactions so nothing has been lost there, but goodness knows what the scammers have done with the computer access. That is still being looked at.

Moral: there are a lot of crooks out there. Be careful.

Regards and thanks for the interesting read.

Cluny MacPherson

Windows 7 Stupidities

It was after I sent an email to you mentioning Xone of Contention by Piers Anthony that I had a recurrence of Windows 7 stupidities.

One was when I was trying to download a file and the other was when I was trying to copy some files onto a nearly empty disk.

On both occasions the transfers could not go ahead because the files to be downloaded or copied were not already on the destination disk.

The message for the copying of one ebook is:

'Could not find this item

This is no longer located in G\books\Parked. Verify the item's location and try again.

Epub

Date created 06/07/2015 16:04'

I was trying to copy the ebook to G\books\Parked – not from it.

I will be going back to XP soon. The Windows 7 madness is getting me down.

Wilf James

Ripping CDs

I have always believed that in a democracy the government makes the laws and the judiciary applies them. Apparently this is no longer the case.

A high court judge has taken it upon himself to declare that the new law regarding ripping CDs for personal use is, in fact, illegal.

One assumes that they do not pick their high court judges off the nearest park bench, but in this case one does have to wonder.

The musicians' union and other interested bodies are back at their old tricks of plucking huge numbers out of thin air and insisting that this represents the financial losses suffered by their members if certain laws are allowed onto the statute books.

In this case, the figure of £58 million pounds has been bandied about. This, mind you, is not as a result of piracy, but of lots of sensible people saying 'I've already paid you with hard-earned readies for your music, and I have no intention of paying you again for the same piece.'

In other words, it is the usual drivel we have come to expect from these mouthpieces.

But this high court seems to have believed this drivel and, presumably under the influence of some sort of god delusion, decided that the government has passed an illegal law.

There are times when even North Korea seems an enviable alternative. At least there you know who the boss is.

John Todd

GET IN TOUCH...

By email
letters@micromart.co.uk

By post
Micro Mart
30 Cleveland Street
London
W1T 4JD

Online
forum.micromart.co.uk

Emulating The ZX Spectrum on PC

I bought Jonathan Needle's excellent Spectaculator program for emulating the ZX Spectrum on PC a while back, but recently I decided to have another look at Spectrum emulation using TZX files with Spectaculator. I can now do the TZXing and this letter explains the route I took. I had some help 'along the way', in particular from Colin Woodcock's excellent book 'The ZX Spectrum on your PC' which is available for just over £1 or so on Amazon using the Kindle app for PC. You have to choose where you want the book sent to. I did not select my wife's Kindle that it appeared to know about already, but instead I selected my own PC. Although written in 2012, and probably in need of an update, the book is brilliant for those with emulators like Spectaculator as it gives quite a few pointers on how to get the best from them.

The hard bit, for me, is getting the right software and my mistake at first was to focus on the hardware side too much. At first it was a bit like 'climbing a mountain' (well I did have to retrieve my 'Computone' Tape recorder hrom the loft) but the software was the real problem. There are 2 main bits of software needed : a sound sampler and then 'Make TZX2' which is available free online. The difficulty with the sampler was that 8 bit was needed but all modern samplers were 16 bit. Colin Woodcock I think said that he used Audacity but I could find no 8 bit options there. Then I got lucky as I tried Sound Forge 'Audio Studio' from Sony: i had bought this 5 or so years ago for converting my LPs but had not really used it ; but it was just what was needed as it had all the old 8 bit options available. So this,I used to make the WAV file which was the first stage of this 2 stage process. At first I found the next stage, converting the WAV file to TZX tricky and the second program 'Make TZX2' was fussy where it had a browse option to select the file needed. It was easy to let it select the whole pathway when it really would only accept the bare file name with " (invereted commas around it) so basically when you select the file this way you have to pare it back each time to just this otherwise it just does a brief flash and does not finish the job. Also I found it best to keep the name of the output file as simple as possible with no gaps or mention of tzx.

> **"Recently I decided to have another look at Spectrum emulation"**

At first I concentrated on missing on 'Lost in Action' files that are mentioned on 'World of Spectrum' in their archive: these are the files that no one has found or submitted. I found I had loads of these (especially educational tapes) that were missing: for instance Kosmos's 'Answer Back' Quizzes. With these there is a main loader program (Junior or Senior) and then you select a quiz name from the many that were available. The quizzes are a lot better than the Junior quiz loader. This software was produced in very small batches and have an almost handmade feel with lots of 'typed out' content labelling. The PC is a lot quicker and better at 'qick loading' this than the ZX Spectrum ever was: you get 'instant action' and no messing about with tapes. Spectaculator has a 'quick load' option which I tend to use for the testing. Sometimes I got the volume level on the tape recorder wrong and and had to redo the recording of the WAV file but mostly it worked first time. The subject or area that I have not fully answered is how to upload them to the various sites as TZX files. This was tricky as unlike JPEGS I found that my PDF prog 'took over' the TZX file (format or container) when I tried to send them as email attachments. Also the files can be TZXed individually or as one big TZX file for all the mini programs that these cassettes often have. So there is lots of detail like that still to work out. But I am working with assets that I already have so it is 'free' from the cost of buying new games. Very boring for my sons but interesting for me and those who had a ZX Spectrum in the 1980s. I don't have to worry about PC games that are released too soon and needing patching and lots of DLC (having not had enough TLC from their original developers!)

But what is the best music to listen to when doing all this TZXing? Well I thought of the 1960s Byrds song (Carol King's) 'Going Back' but the YouTube video was not one of their best. A better choice for me to lyrically ruin (Ernie Wise style) would be Chris Hillman's 'Old John Roberson' on the Byrds 'Younger than Yesterday' CD. So here it is 'Old John Robertson he was a Spectrum Man And ZX emulation was his retirement plan' etc. The song refers to the death of his wife and here we can substitute the 'dear old Speccy': and of course it did not really 'die', it only crashed a lot, as it had edge connector problems even when bolted on to an Opus Discovery! (So lots of unbolting for me still to do!)

Harry Deakin

LaptopScreen.co.uk

Need a new screen for your laptop? Look no further

DETAILS
- **Price: Depends on the model of laptop**
- **Manufacturer: Various**
- **Tel No: (0114) 352 0098**
- **Website: goo.gl/YQFCkT**
- **Requirements: Shipping charges will apply. and can vary based on your location**

There's every conceivable laptop make and model available from LaptopScreens.co.uk

Laptops and other mobile devices are all fine and well, but they do have one annoyance in common: replacement parts. Generally, should something go wrong on a desktop PC it's a relatively painless process to swap out the faulty and replace it – even more so if the monitor is at fault. On a laptop though, you're going to need to get your hands in there, and it can be a daunting experience for most users.

There are other factors involved too, such as finding the right make and model parts, delivery, and pricing. In terms of a laptop screen the sheer number of models is bewildering, and each requires a slightly different method of fitting. Thankfully, Laptopscreens.co.uk or UKLaptopScreens, offers the customer a more relaxed and thorough replacement service. With a huge array of screens available, from Acer to Apple to Dell and beyond, including individual model numbers and screen types, UKLaptopScreens takes a lot of the stress of replacing a faulty screen out of the equation.

We tested the company's abilities with a replacement screen for an older Dell E6410. Once we'd located the correct make and model, we were offered a choice of two screen types: 1440 x 900 and 1280 x 800. Luckily we knew which resolution model to go for, but for those who don't there was a handy YouTube video that described how to find out the resolution in layman's' terms.

With the correct screen identified, it's just a simple case of clicking on the Buy button and following through the purchase procedure. There's a lot more to UKLaptopScreens in terms of customer service, though. You'll find YouTube links on specific screen pages displaying installation guides, see a selection of Frequently Bought Together items that will generally include anything else you may need in terms of tools or other parts, and a long list of handy tips and a thorough explanation of the jargon used, that helps demystify the technology somewhat.

The screen arrived within a few days, and following the video we were able to confidently replace the faulty old screen without too much fuss and extra cost. In fact, the entire cost of the replacement was £61; not a bad price for replacement screen on a laptop that's been out of warranty for several years.

UKLaptopScreens also offers a handy contact and questions section from its site, with FAQs regarding exchanges, returns, warranties and so on. There's also a helpful 'Can't find Your Screen?' walkthrough and a couple of sections where you'll get access to the company's phone, address and a contact form with various customer request functions along with the ability to upload images to help them answer your questions. Online chat is also available to help if you're still confused.

Our brief experience with UKLaptopScreens was very positive. Its site is easy to use, there's plenty of advice and videos for a wide range of models (the company apparently holds over 47,000 screens in stock), helping you feel a lot more confident about undertaking such a task. **mm David Hayward**

A superb service, with plenty of stock for virtually every laptop

Netgear Powerline PL1200 Twin Pack

Netgear branches into high performance Powerline products with the PL1200

DETAILS
- **Price: £70 (Amazon)**
- **Manufacturer: Netgear**
- **Website: www.netgear.co.uk**
- **Requirements: Wired Ethernet network, mains electricity**

Back in February Devolo rolled out its 1200Mb/s Powerline adapters and, with the appearance of the PL1200 and PLP1200, its Netgear's turn to breing its equivalent hardware to market.

The PL1200-100UKS is relatively small by Powerline standards, and made to extend about 5cm below the wall socket position. The flipside of being unobtrusive is the PL1200 design doesn't provide through power, so it needs an empty socket all to itself. Those of you reading that and thinking 'I'll just stick it on a gang socket' had better think again because, while it *might* work, you certainly won't get the best performance.

The twin pack provides two identical PL1200, each offering just a single gigabit Ethernet port to connect them to the wired network. As that specification hints, how you could possibly get 1200Mb/s over this technology, when you've got 200Mb/s less than that at either end is a conundrum you can solve easily yourself. Maybe with four of these devices, and two pairs talking exclusively to two others you might be able to use all the bandwidth, but we're talking very hypothetically.

My experience with the Devolo 1200Mb/s equipment revealed that, while this technology is superior to the 500Mb/s and 600Mb/s predecessors, depending on the wiring in your home speed can vary. As a general guide I found adjacent room connections to get more than 300Mb/s, but that over longer distances this can drop to 100Mb/s or less. In my testing, a file transfer using a HP EX2 NAS box resulted in a speed of about 240Mb/s (around 30MB/s), which was slightly shy of what I was expecting. That's fine, though, and much better than 10/100 Ethernet. It's only around a third of what I can get from gigabit Ethernet, however. .

What you're doing here is trading convenience for performance. This hardware is remarkably easy to deploy, but not as quick at sending data around. It's also worth pointing out that, while running physical cables does deliver the best results, it doesn't offer much in the way of flexibility if your plans regarding how to utilise your rooms changes further down the line. In comparison, this kind of Powerline equipment can be unplugged and moved elsewhere – even to a new house – and the time the whole job takes be measured in seconds.

Another plus point for the PL1200 is how competitively priced it is compared with other 1200Mbps specification kit. TRENDnet's TPL-420E2K kit is just a few pounds cheaper and not as nicely made, whereas Zyxel's PLA5405 is similarly positioned. Devolo want the same money for a single 1200Mb/s adapter, though that is the best Powerline hardware I've tested.

If you want to extend your network, and you've no intention of streaming 4K video or moving HD movie files around then 500Mb/s Powerline products are fine for gaming and surfing. Those who want more, or have more users to connect, might be served by this equipment. Just don't expect gigabit speeds out of it.

mm Mark Pickavance

Affordable, discrete, easy-to-install 1200Mb/s Powerline adapters

Specifications
- Dimensions: 100 x 56 x 30mm (4.5" x 2.2" x 1.18")
- Weight: 112.5g (0.25lb)
- Power consumption: Standby 0.471W, on-state 2.44W, full power 3.47W
- 1200Mb/s Powerline interface
- 10/100/1000Mb/s Gigabit Ethernet port
- Typical coverage up to 500m² (5,832ft²)
- HomePlug AV21 compliant
- Works with HomePlug AV and HomePlug Green PHY
- IEEE 802.3 compliant

BT Dual-Band Wi-Fi Extender 610

Mark checks out BT's own-branded 'n' class wi-fi extender

DETAILS
- **Price: £40**
- **Manufacturer: BT**
- **Website: www.shop.bt.com**
- **Requirements: 802.11n wi-fi access point or router**

Having covered BT-branded gear recently, I've come to the conclusion that it avoids the bleeding edge of technology, because that invariably generates support problems. That reluctance, in a nutshell, defines this relatively inexpensive wi-fi Extender.

At this price, the 610 was never going to be 'ac' technology, though frankly dual channel 'n' is probably more useful to most people. What always impressed me immediately on unpacking this is how nicely BT kit is made. This uses very high quality tooling to produce a really distinctive look; styled in common with the Home Hub 4 and 5 by continuing the metal band motif, this time on white plastic. On the practical side, the unit is designed to be plugged into a UK mains socket, and has on the front a WPS button and a myriad of lights, and on top an Ethernet socket, reset hole and On/Off switch.

As it is meant to be deployed by the less technically minded, the instructions direct the purchaser to use WPS as the means of connecting the router. In theory, you simply plug it in near the router, wait for it to start a flashing light sequence and then push the WPS button on the router and then on the 610. Once the lights tell you that it's established a link, you can unplug it and deploy it to the best location for your building. That's where, I suspect people run into problems, because wireless connections aren't remotely as bankable as those with wires.BT tried to help with LEDs that indicate if the 610 is, 'too close', 'too far' or is at a 'good range', using some kind of Goldilocks logic; except wi-fi can be remarkably fickle and, when your neighbour overlaps exiting wi-fi channels or your house is made with metal mesh in the walls, all manner of weirdness can transpire.

When operational the extender takes the existing SSID of the router and adds EXT2 and EXT5 to the front of it for the two channels. You can use the same password as the host router to access these, or the one printed on the rear of the 610.

Personally, I had no issues configuring the 610 in this way, but it's easy to imagine many scenarios where it might not go as smoothly. One issue is that you might not have a WPS button on your router. There is a means to manually configure using a downloadable software tool from BT, however. Or rather that's what they tell you to use, but it actually just finds the IP and then opens a web location for you to access the advanced controls.

Using these you can give the extender any SSID you like and also change the passwords you use to access them – and you can also give it the same name for both channels. The cart-and-horse scenario here is that you need to get it working with the router before you can generally get this to work to make the changes.

The truth is, however, that I have sympathy for BT, and other wi-fi hardware makers. As simple as they try to make whole set up procedure, there

Standards	Wireless: IEEE802.11a/b/g/n
Security	WPA (TKIP), WPA2 (AES), WPA+WPA2
Frequencies	2.4GHz: 150Mb/s (20MHz mode), 300Mb/s (40MHz mode) 5GHz: 150Mb/s (20MHz mode), 300Mb/s (40MHz mode)
Lights	Power, Ethernet, WPS (blue) Position indicators, Too Close-Too far (blue/red), Good (blue)
Ports	RJ45 (IEEE 802.3 10/100 Mb/s)
Buttons	Power (On/Off), WPS, Reset (Pinhole)
Weight	167.4 g
Size (W/L/H)	7.1cm x 7.7cm x 12.1cm

will invariably be wrinkles that only some technical knowledge can smooth out. That's just the nature of the technology and the wide variety of situations it can, and inevitably will, be deployed in.

One oddity I noticed, though, was that the 610 only uses the 2.4GHz channel for the backhaul, somewhat capping the performance for uploads. However, if they'd not done this then the range of the device would have been severely compromised, because 5GHz isn't as adept at dealing with extended distances.

> **“This uses very high quality tooling to produce a really distinctive look”**

I've got a complaint, however, but it's a minor one: while the system will show you the MAC address of connected systems there isn't any means to filter based on this credential. You can disable the WPS button, though, for those who don't like guests who assume they can just connect to your network whenever they come around.

As balance, in the 'liked' column I'd like to make note of the power management technology, which uses a maximum of 5.8W when in operation and drops to 2.7W when standby becomes active five minutes after it was last accessed.Also, if you search around you can get this kit for less than £30, which is an absolute bargain.

I'm aware that some people have had real problems with this hardware's predecessor, so I'm reticent about giving it a massive thumbs-up. My experience was largely a good one, though, with it doing exactly what BT promised. If you can follow some basic instructions and don't have the home from wi-fi hell then this equipment *should* work fine. The problem with wireless comms is there aren't any guarantees, I've concluded.

mm Mark Pickavance

A simple and cheap means to extend your wi-fi network; providing the foibles of wi-fi don't mess things up

Transcend MSA370

Proof that mSATA isn't done with just yet

DETAILS
- **Price: ~£200**
- **Manufacturer: Transcend**
- **Website: oo.gl/e4ZIMq**
- **Requirements: mSATA connection, Windows XP+, Linux Kernel 2.6.31+**

It may feel like mSATA is a bit of a dying breed these days, what with the M.2 format taking precedence and gradually replacing it. However, there's still life left in this relatively young format yet, as Transcend have proved with its MSA370 range of storage devices.

The MSA370 comes in several capacities of 16GB, 32GB, 64GB, 128GB, 256GB, and the one we're currently reviewing in this instance, a decently sized 512GB. This tiny (50.8 x 29 x 4mm) MLC NAND Flash memory device weighs only 8g, but is able to support SATA III 6Gb/s, Power Shield, TRIM, NCQ and S.M.A.R.T. commands, as well as provide Wear Levelling and Intelligent Block Management. In addition to that, Transcend has made sure that the device is Intel Smart Response Technology capable, meaning it can be used as a cache memory reservoir between a traditional hard drive and the system memory.

The MSA370 uses the Transcend TS6500 controller, which in itself is a rebranded Silicon Motion SM2246EN. This is a popular and proved technology, providing a decent throughput of data while retaining a good level of reliability. We fitted the drive to a Gigabyte P37X gaming laptop, with an Intel i7-4720HQ processor at 2.6GHz, 16GB of memory and Windows 10 installed – and it clocked an impressive 563MB per second read using the 8192KB test in ATTO, while also scoring 487MB per second on the write test with the same file size. The 4KB test saw a read score of 137MB per second, and 283MB per second for the write test. All good numbers, and more than enough for to provide a significant upgrade from a more traditional hard drive.

The Transcend MSA370 512GB mSATA drive is pretty quick

Needless to say, booting to the OS desktop took mere seconds; Windows 10 is already pretty quick on this specification laptop, but using versions of Linux – we tested Mint 17.2 Cinnamon, Ubuntu 15.04 64-bit, and Fedora 22 – backed up the initially impressive results and proved to be extremely quick, both for booting and in use.

The price isn't too bad either. Around £200 the MSA370 is reasonably good value for money, especially considering the speed and the amount of storage you're getting. You could easily find a cheaper mSATA drive out there, but Transcend has a good history of reliability and longevity when it comes to its drives. In essence, you're buying the brand name as opposed to just the drive itself, but can sometimes be its own form on insurance.

It's also reasonably priced, and makes for an excellent upgrade

This is a good solid state drive; fast, with ample storage and perfectly pitched for laptops and smaller systems. We didn't get to test the Intel Smart Response Technology, but since the speed of the drive is good we imagine the caching between a hard drive and system memory would reflect what we saw in our ATTO test.

mm David Hayward

A fast, well-priced mSATA drive with good capacity

Xara Designer Pro X11

The latest update to Xara's high end product, Designer Pro X11

DETAILS

- **Price: £220 (X10 upgrade: £65.00)**
- **Manufacturer: Xara**
- **Website: www.xara.com**
- **Requirements: Microsoft Windows XP-8.1, Intel Celeron or AMD Sempron processor or newer. 500MB RAM, 300MB hard disk space for program files**

This version of Designer Pro includes the features from their Website designer

It's easy to create your own scrapbooks, collages or calendars.

Xara are one of the oldest software developers in the UK; starting in 1981 it has been responsible for some very innovative software, mainly in the realm of graphics. This latest product Designer Pro X11 is the culmination of its work in this field. Combining the elements from all of the Xara graphic products into a single all encompassing program that, certainly at the latest price, represents excellent value for money. It includes Vector Illustration, drawing, Photo Editing, Web Design and DTP layout all within a single context-based interface, giving you just about everything a graphic designer could ever need. It also comes at a fraction of the cost of other leading brand products.

So what's new in version X11? Well to start with it incorporates the latest features of the recently released Web Designer 11 product; things like micro animations that slide in from the side of the page, or animated buttons that stretch and wobble when you mouse over them. Another is Sticky Objects – bits of text, buttons or graphics that stay where they're put no matter how a page moves. For example you could stick them to the top or side of the screen making them always accessible, while the rest of the page is free to scroll. This version also adds the popular full width backgrounds to your pages. These are also semi-intelligent in that they will stretch or contract to fit the screen size.

If you work from more than one location, you can now sync your documents via Dropbox or Google Drive, meaning any edits you make will be updated by Designer Pro on the other computers you might work on.

Other new features more relevant to desktop publishing or word-processing, yet obviously useful whatever the project, are auto correction and hyphenation. These can firstly make your documents more readable, and secondly improve your workflow by substituting long words or symbols using abbreviations.

If graphic design is more your thing, the new art brushes and blend modes will allow you to be more creative, yet without the hard work normally needed to create these effects.

While Designer Pro has been updated with lots of new features and content, the main structure and speed that's always been an outstanding plus point for Xara remains as fluid as ever. It's one of the reasons I've been a long time user of the program. There's nothing that destroys your creative flow as much as twiddling you thumbs waiting for the program to catch up with you. This is particularly noticeable when you have a complex website, or multi page document. When for example you need to scroll or move an object to a different page. As it happens, Designer Pro has handled everything I've ever thrown at it, and that includes some pretty large and complex graphics. So I have no hesitation is recommending it.

As usual the package includes a massive range of templates and clipart for projects, both web and print based; they encompass everything from widgets for your websites, to images and logos. Finally, as an added incentive to those interested in the web elements in this release, Xara has included web hosting for 12 months with two gigabytes of hosting space and one free domain name.

In truth Designer Pro X11 includes much more that I could fit into a short review, so my advice would be to download the trial program from the Xara website and try it for yourself. It's free so what have you got to lose? **mm Joe Lavery**

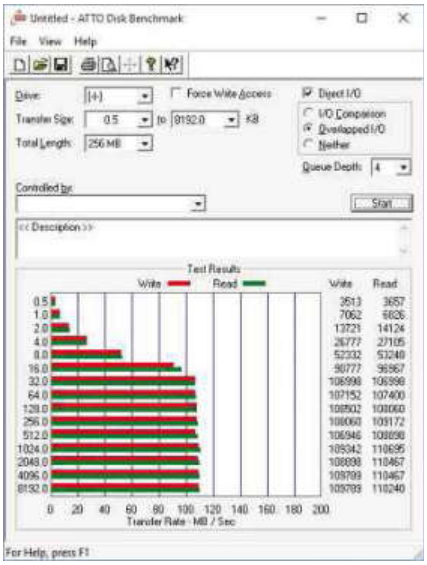
A good value upgrade to what was already a fine product.

WD 2TB My Passport Ultra

A reasonably priced, and sizeable backup solution

DETAILS
- **Price: ~£80**
- **Manufacturer: Western Digital**
- **Website: goo.gl/GEze4N**
- **Requirements: Spare USB 3.0 port for best results, Windows Vista+ for software**

The new styling used for this latest generation of My Passport Ultra looks good



The smaller file sizes may struggle, but the drive picks up for the larger data chunks

This is the seventh generation of the popular My Passport Ultra product range, Western Digital has kept the line going for quite some time now, and it shows no signs of getting long in the tooth either. With a redesigned USB 3.0 bus powered interface and a flashy new look, this new generation of My Passport Ultra drives comes in a variety of capacities and colours. There are 500GB, 1TB, 2TB and 3TB models on offer in black, blue, red and white coloured chassis'.

Here, we have the 2TB Blue, which is presented in a sleek and compact case with a solid Noble Blue, as we're told, top where the WD and My Passport Ultra logo is clearly labelled.

The bottom of the drive has four small rubber feet, and to one end you'll find the SuperSpeed USB 3.0 WD connector, along with a small white LED indicating if the drive has power. The chassis is fairly solid, but as with the other new compact WD My Passport drives, a drop from more than a couple of feet will probably result in a broken case, or worse a broken drive.

The drive is pre-formatted with NTFS, leaving 1.81TB of space free in a single partition. The partition comes with a set of WD tools for backup, security and utilities, all you need to do is double click the WD Apps Setup launcher and you can install all or each program individually.

The WD Drive Utilities allows the user run a set of basic diagnostics to check the status of the drive, along with identifying any potential performance issues. There's also a Drive Erase function, and a Sleep Timer setup. The WD Security tool lets you set a password that will activate the hardware level 256-bit AES encryption on the drive. You can specify a password along with a password hint and you can choose to have the drive auto-unlock itself for a particular user and computer.

Finally, the WD Backup tool will let you create a number of backup plans to either the drive itself, or a cloud facility such as Dropbox. You can setup schedules, include or exclude certain files or folder and restore the content through the program interface. However, there's no option to image a drive.

With the My Passport Ultra connected via USB 3.0 to an Intel i7-4790K with 16GB of memory, the ATTO scores on the 8192KB test came back with 110MB/s read, and 109MB/s write. The 4KB transfer test scored 27MB read and 26MB write. Although reasonable, the scores on the Ultra are slightly lower than that of the My Passport X of the same capacity.

The smaller file size transfers are slightly concerning, as a lot of system backups will include relatively small amount of data. But the drive does appear to pick up once it hits the 16KB file sizes, which are more likely to be included in an average backup.

The WD My Passport Ultra is a reasonably good backup device for most computer users. The capacity is certainly useful, and could potentially allow you to backup several computers from your home to the same device, and it'll be more than quick enough for regular incremental backups as part of a routine to ensure the integrity of your data. The software is good enough for the job at hand; it's easy to use and functional too.

For around £80 this is a good buy; slightly more affordable than the aforementioned My Passport X (reviewed over), and the performance isn't too bad either. In short, a capable backup medium.

mm David Hayward

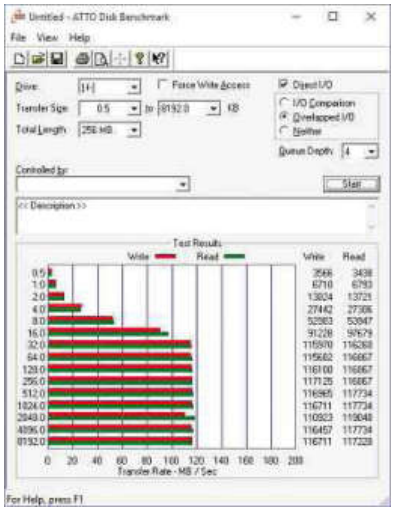
A suitable and compact backup device for your PC

WD 2TB My Passport X

Need more storage for your console? Look no further

DETAILS
- **Price: ~£95**
- **Manufacturer: Western Digital**
- **Website: goo.gl/6SFm3t**
- **Requirements: USB 3.0 port for best results, works with PC, Mac, Xbox One, PS4, PS3, Xbox 360**

The WD 2TB My Passport X is certainly a stylish looking external drive



The ATTO benchmark scores are okay, too

One of the biggest problems facing a modern console owner is the lack of hard drive space these things ship out with by default. True enough, there are ways and means to upgrade the current storage in an Xbox One or PS4, but often this relies on some screwdriver work, and a loss of warranty for the user. Western Digital, though, has come up with a tweaked version of the solution used by many PC users: a USB 3.0 external hard drive.

The WD My Passport X is a 2TB hard drive with that measures 110 x 20.96 x 81.6mm and weighs 230g. The design is realised ina sleek, black plastic that's tough enough for general use and portability; although it probably wouldn't survive a drop from more than a couple of feet. The top of the drive chassis is ridged, with a glossy WD logo and My Passport X logo to one side, whereas the bottom of the drive features four small rubber feet. To one end, there's the SuperSpeed WD connector with a single, small white LED to indicate that the drive has power. It's certainly a good quality chassis, and keeps in the same style as a modern console.

It's compact enough to carry in your pocket, but has more than enough space for your games and media

In the box you get the drive itself, a very small (around 12") WD connector-to-USB 3.0 lead, and a quick information card displaying the drive being plugged into the appropriate USB port on an Xbox One. Let's face it, you don't need a huge amount of technical knowledge to be able to plug an external drive into a USB port; regardless of whether that's on a console or a PC.

The drive is NTFS pre-formatted with about 1.81TB of space actually available for you to use. However, in terms of formatting from the Xbox One, or any other console, that number may alter accordingly depending on the system you're using.

We ran the My Passport X through the usual drive benchmark, using ATTO and connected to an i7-4790k, with 16GB of memory. The results weren't too bad, with the 8192KB file transfer scoring 117MB/s on the read test, and 116MB/s for the write test. Interestingly, the 4KB file transfer only managed a rather poor 27.3MB/s read and 27.4MB/s write. Clearly the drive is better at moving around big files as opposed to smaller file chunks. It would be interesting to see how it fares when compared to other USB 3.0 external drives.

The WD 2TB My Passport X worked well enough on a PC as an external hard drive, the speeds are reasonable and can be used as an external storage device for some PC games. We can't speak for its use on an Xbox One as we don't own one, unfortunately. However, it did work perfectly well on a PS3 as a media device and storage medium.

At around £95, the WD My Passport X is a decent enough buy for 2TB of external storage for your overfllowing console. WD are generally pretty good when it comes to reliability, and seeing as this model comes with a three year limited warranty, there's a certain amount of confidence you can take in your purchase. It would have been good to include a carry case of some description, especially given the target market, but that doesn't detract from this being a good USB 3.0 external drive.

mm David Hayward

Reasonable speeds, and a stylish drive with more than enough storage for a console owner

GROUP TEST

Multifunction Printers

Remember the time when you had a printer, a scanner and a fax machine on the same desk or spread across a number of desks? These days, the multifunction, all-in-one printer, copier and scanner (with fax and other online services) has taken over – thankfully.

David Hayward takes six multifunction units and puts them to the test to see which are worth spending your hard earned cash on.

Multifunction Printers

HP Officejet 4630

DETAILS
- Price: £60
- Manufacturer: HP
- Website: goo.gl/506sZM
- Requirements: Windows Vista or later, Mac OS X 10.6 or later, internet connection, HP mobile apps

The HP Officejet 4630 is a pretty good buy for the home user

One name you're bound to come across when looking for multifunctional printers on the shelves of high-street electrical stores is HP. The sheer number of HP printers, and their similarity to one another can be a little confusing for consumers, but there's something reassuring about the design of its products. You get the feeling that you'll get the same quality throughout all the ranges, to some degree. The Ford of the printer world, you could say.

The HP Officejet 4630 e-All-in-One multifunction printer is a product of modern home office solutions. It scans, faxes, copies, prints, is wireless and USB and has automatic duplexing. The only thing it doesn't do is make you a cup of tea in the morning.

This particular model was actually one of the first to accommodate printing from a smartphone or tablet, and it features AirPrint, the Apple protocol from OS X Lion and iOS 4.2 onward. There's also a scan to email feature, and through the wi-fi functionality you also get HP ePrint, which allows you to send a print to the printer's email address. In fact, you can administer the printer remotely if needed.

The design is surprisingly compact considering the rather large 35-sheet document autofeeder that sits atop the printer. It's actually quite a handy feature and one that you'll soon come to appreciate, especially if you're housing the printer on limited desktop space.

It's finished in a matt-black effect with a glossy, polished area for the front control panel. The control panel itself is reasonably simple to understand, with touchpad buttons to cycle through the various menus, a home button to return you to the start and OK to enable the highlighted selection. Alongside the LCD display you'll find buttons for the wi-fi, ePrint or AirPrint and a rubberised number pad for the fax function.

Getting everything up and running and using the more modern aspects of the printer are also easy enough, thanks to the accompanying software. Once up and running, the printer performs well, with printing speeds of around 8ppm for text and 5ppm for colour.

The standard black cartridge can handle 190 pages and the individual colour cartridges (yellow, cyan and magenta) have a yield of 165 pages. The XL versions of each cartridge can offer a lot more pages, obviously, with black XL having a yield of 480 and the colours at 330 each. Price per page, based on the standard cartridge, comes out with black at £11.55 from **Cartridgesave.co.uk** at 5.1p per page. Colour, at £11.16, was calculated at roughly 6.8p per page.

The quality of both the text test and the photo test were very good. The lettering was clear, with no signs of stray ink blots, and the colours were generally good, although probably not as deep or rich as we've seen in the past with other home inkjets.

The HP Officejet 4630 is a good enough printer for the home office worker. There's a lot of functionality from this model and considering the price, it's certainly one to think about for your next purchase.

HP Deskjet 1510

DETAILS
- Price: £30
- Manufacturer: HP
- Website: goo.gl/GYvE6E
- Requirements: Windows XP or later, Mac OS X 10.6 or later, spare USB port

The HP Deskjet 1510: perhaps it's time to lay it to rest?

The HP Deskjet range of printers has been around for what seems like an eternity. This particular model, the 1510, is nearing the end of its life and is soon to be replaced by the 25xx series. However, since it's still a cheap-as-chips workhorse, it still seems to be holding onto some shelf space.

The HP Deskjet 1510 is the base, entry-level multifunction printer from HP. Although it's a pretty unassuming looking printer, it's designed to be a simple as possible while still offering basic multifunctional duties for as little as £30, from the likes of Amazon.

The Deskjet 1510 can scan, copy and print up to 60 sheets from the flip-up paper tray, while spitting the printed documents out through the pull-down tray at the bottom of the printer. The control of the printer is pretty simplistic; there's no fancy LCD display, and since this is USB connection only, there are no e-related functions or smartphone abilities. The control panel, therefore, is just a press pad affair for power, cancel job, mono and colour scans. It works, but we did find that we needed to really give the pad a good push to activate the button. It put us half in mind of the hit and miss keyboard on a ZX81.

The genuine HP 301 cartridges work with this model, with the standard black ink cartridge costing £11.55 from Cartridgesave.co.uk and offering 190 pages at 5.1 pence per page. The colour cartridges cost £13.39 from the same place and last for 165 pages at 6.8 pence per page. Naturally, there are XL versions of each, which last for 480 pages black and 330 pages colour. They give a slightly better cost per page at an average of around 4.2 pence.

> **"It actually took about three minutes for the print to finish"**

Text printing was measured at around seven pages per minute, with colour being measured at an astonishingly slow less than one page per minute. It actually took about three minutes for the print to finish. We're not sure why it took so long to spit out a colour print, but for some reason the printer decided to stop midway through the print and take nearly 50 seconds to contemplate what it was doing next.

As for print quality, the HP 1510 wasn't brilliant. A page of text was readable, and although there were some smears and a dab of loose ink at some points, the text on the page was okay.

Despite the initial cost of just £30, the saving just isn't worth the pain of actually using the printer. The multifunction elements work well enough, but slow printing and poorer quality means you'll be left wanting sooner rather than later.

micro mart
5 Quality
5 Value
4 Overall

HP Envy 4507

DETAILS
- Price: £50
- Manufacturer: HP
- Website: goo.gl/n1a8ql
- Requirements: Windows Vista or later, Mac OS X 10.6 or later, internet connection, HP mobile apps

Although very sleek looking, the HP Envy 4507 gave us no end of printing troubles

The print quality was below average for a consumer HP model

The HP 4500 range of multifunction printers were very much the darlings of high-street electrical stores early last year. This was the newer range of inkjets from HP, covering 2013/14, and for the most part they did a reasonably good job and shifted off the shelves quick enough to replace the older Deskjet 3500s.

This is a fairly slim, low-profile all-in-one printer offering print, copy and scan functionality. In terms of connectivity, there's USB and wi-fi, with Apple AirPrint and HP ePrint support. As with the previous Officejet, you can also send documents to print via your smartphone or tablet, and if needed you can also administer the printer remotely.

It's quite a discreet unit, looking not too dissimilar to the HP Deskjet 3520 that came out earlier in 2013. The same kind of LCD is used, as are the side touch-sensitive buttons for navigating the system menu, enabling a highlighted function or going back to the beginning with a home option. There are also the same three wi-fi on/off, help and ePrint buttons as you'd find on the Officejet 4630.

Unfortunately we found the Envy 4507 to be a little too cheaply produced. The quality leaves a lot to be desired, and there were plenty of times where the paper was fed through the printer at an angle, which then caused all manner of problems when it came back out again. It was also the only printer to actually jam from the word go. The first print sent through concertinaed up and proved to be quite the pain to unfold and clear away. After that, the rest of the pages were left with a slight fold along the top of the page or some ink smudges.

The text test we ran saw a print rate of around eight pages per minute; the colour managed to score a faster than normal five pages per minute. The quality, though, was less than average. The text was a little faded and not anywhere near as sharp as some of the other printers here. And the colour was pretty drab and felt washed out compared to what we've been used to.

The print cartridges used are the 301 range, once more. That means you'll get the same as the Officejet 4630, but to reiterate this means the standard black cartridge can handle 190 pages and the individual colour cartridges (yellow, cyan and magenta) have a yield of 165 pages. The XL versions of each cartridge can offer a lot more pages, with black XL having a yield of 480 and the colours at 330 each. Price per page, based on the standard cartridge, comes out with black at £11.55 from Cartridgesave.co.uk (5.1 pence per page). Colour cost £13.39 (6.8p per page).

This model is priced at £49.99 from Currys, although you may be able to find it cheaper if you shop around. While the functionality is good, though, the quality of the printer and the printing isn't. Try before you buy, if possible.

Canon Pixma MG4250

DETAILS
- Price: £44
- Manufacturer: Canon
- Website: goo.gl/1QXLIN
- Requirements: Windows XP or later, Mac OS X 10.5 or later, Canon apps for both iOS and Android, cloud service account

The MG4000 range of Canon Pixma printers are mid-level home and SOHO multifunction, all-in-one printers. They generally offer better performance and are quite heavy duty machines used for mid-volume printing and scanning.

The Pixma MG4250 is the succeeding generation model from the MG4150 from early 2012, and aside from the aesthetics of the chassis, there's really very little difference between the two.

This is a print, copy and scan device with wi-fi and USB connectivity, Apple AirPrint, Pixma Cloud print and Google Cloud Print support, as well as a memory card reader and automatic duplex printing.

The design is robust enough and features some neat extras to help lure the consumer. For example, there's a full-colour 62mm LCD located in the top corner, which can flip up and display the relevant printer menus and controls, as well as a preview of the contents of the memory card – although for some reason we couldn't get this feature to work. Below the LCD are an array of control buttons to navigate through the menus, set the number of copies, select colour or mono prints and copies and cancel any jobs, among other things.

The Canon Pixma MG4250 is excellent and well priced

The running costs may be a tad higher, but it's worth it

> **"The quality is the one of the best we've seen from a sub-£50 printer"**

The input tray can handle up to a hundred sheets and is fed through the front pull-down panel. This too is surprisingly well built and feels like it has been manufactured to a much higher standard than most of the HP model printers here.

Our full text page test saw a speed of 8.5 pages per minute, with the colour taking longer at two pages per minute. Although it's not the fastest printer, the quality of both the standard text page and colour were excellent. The text stood out with visibly sharper lines and edges to the lettering, and the colours were deeper, richer and far clearer than anything else so far.

The standard black and tri-colour cartridges offer 180 pages each, with the option for high yield versions to be fitted that can improve those numbers up to 600 pages for the black and 400 pages for the colour. In terms of cost per page, the standard black cartridge costs £13.56 from Crtridgesave.co.uk and has a cost per page of 6.2 pence. The standard colour cartridge, priced at £16.80 from Cartridgesave.co.uk, comes to 7.8p per page.

The Canon Pixma MG4250 isn't the cheapest printer to run, with the standard cost per page being a penny more. That doesn't sound like much, but factor in the printer lifetime and the amount of pages you may print and it does add up. Nevertheless, the quality is the one of the best we've seen from a sub-£50 printer.

All in all, it's a good printer. You can pick one up for around £44, again from Currys, but also as before you can probably find a slightly cheaper price if you shop around.

Canon Pixma MX525

DETAILS
- Price: £69
- Manufacturer: Canon
- Website: goo.gl/V2uNCW
- Requirements: Windows XP or later, Mac OS X 10.6 or later, spare USB port, Ethernet, cloud service accounts

The Canon Pixma MX525 is billed as the direct competitor to the HP 4630, in that you can copy, scan, fax, print and with support for smartphones and tablets, along with Apple AirPrint and internet printing from any device and location. It also goes one step further and adds support for cloud technologies, allowing you to scan directly to your DropBox account and the Pixma cloud.

As before there's a 30-page automatic document feeder sitting on top of the printer, but this time it's in a nicely designed and compact setup that doesn't feel like it's simply bolted on as an afterthought. In fact, the entire design is quite sleek and would fit comfortably on a desktop without getting in the way. However, the plastic did feel a little cheaper compared to its HP competitor. It wasn't anything too bad; it's just the chassis of the printer wasn't particularly great.

There's ample connectivity here with USB, fax phone sockets (RJ11), wi-fi and Ethernet and there's also a 62mm colour LCD screen to navigate through the menus with. The control panel itself is spread across the front of the printer, with various buttons to directly enable or disable certain functions or to switch the printer to scan mode, among other examples.

The Canon Pixma MX525 is a pretty good printer, but a tad more expensive than the competition from HP

It has pretty much everything you could ask for

Naturally, the software can handle all this without you needing to interfere with the buttons, and as before, you can also administer this printer remotely should you ever require.

The MX525 uses a pair of cartridges: a single tri-colour and single back. While it cuts down on the packaging and manufacturing processes, this can be both a blessing and a curse. Often in these situations, you'll run out of one particular colour and have to replace the entire cartridge even though the other colours are still reasonably full.

Print speeds were roughly the same as the other printers we looked at, with text being about 8ppm and the colour glossy being 3.5ppm. In terms of yield, both the standard black and colour carts will cope with 180 pages, whereas the XL versions will last for 600 and 400 pages respectively. The cost per page of the standard black, as priced at £13.56 from Cartridgesave.co.uk, is 6.3 pence; the standard colour cost per page, at £16.80 from Cartridgesave.co.uk, is 7.8 pence.

The print quality is good, though not as good as the Pixma MG4250, at least not in our minds.

Overall, the Canon Pixma MX525 is a great multifunction printer. There's a touch more technology involved than the HP Officejet 4630, and it matches it when it comes to print quality. The only major issue is that it costs in the region of £69, nearly a tenner more than the HP 4630. In the end, it'll come down to print costs, which are cheaper by a penny for each cartridge type for the 4630.

Brother MFC-J4620DW

DETAILS
- **Price: £95**

Manufacturer: Brother
Website: goo.gl/tlAZDL
Requirements: Windows XP or later, Mac OS X 10.7 or later, wi-fi, Ethernet, various cloud service accounts

The Brother MFC-J4620DW is an exceptionally good and capable printer

But it's quite expensive for an inkjet and has SOHO users in mind rather than the casual home user

This Brother model printer is aimed squarely at the small and home office sector. It sits in the mid-level of the SOHO Brother range and offers an astonishing array of features that will keep most users happy for as long as the printer still functions.

Obviously there's the usual scanning and copying functionality, but the MFC-J4620DW goes a step further and adds printing up to A3 size, faxing and the ability to connect to OneDrive and Dropbox. There's also support for NFC, AirPrint, Google Cloud Print and iPrint&Sca, and you'll find 802.11b/g/n wi-fi and a 100Mbps Ethernet port.

It's certainly a well built machine and feels finished to a much higher quality than the more run-of-the-mill printers in this group test. There's a 20-sheet autofeed discretely incorporated into the top of the printer, auto-duplexing and a large 93mm colour touchscreen, which allows you to access the printer options, along with the cloud services.

Print speeds weren't the best in the group, though. The full colour photo test took just over two minutes to finish printing at full resolution, whereas the text test saw around eight pages per minute. However, the quality of the colour image was very good indeed. The colour were bright, and there was a slightly more defined level of sharpness to both the colour and standard text prints.

In terms of the cartridges, the larger XL versions (based on a four pack) manage to offer an impressive yield of 1,200 pages each and cost £29.56 from Cartridgesave.co.uk. This comes to an equally good 0.5 pence per page, which is ideal for the SOHO user.

The standard cartridges aren't too bad either, with the black cartridge costing £16.71 from Cartridgesave.co.uk and having a page yield of 550 at three pence per page. The colour costs £11.97 and too gives 550 pages before it's run dry while having a running cost of 2.2 pence per page.

The Brother MFC-J4620DW is by far the cheapest printer to operate out of the group, but it's also the most expensive to buy. At around £95, the initial cost may put a lot of people off, especially since this is an inkjet and not a laser.

Again, though, this is due to the more home business and small office design of the printer; it's a cost effective setup for an office, and it'll do a good job when placed in one. For the home user, though, it may seem a little over the top for the occasional printed receipt or delivery label. If you're planning on printing out a number of full-colour, high-quality holiday snaps then, yes, it's an ideal printer. But not many people do that these days, and you can get just as effective a solution from a printer that costs a third of the Brother.

Canon Pixma MG4250

We thought the Canon Pixma MG4250 represented the best in terms of print quality, design, specifications, features and printing costs.

It's a great printer for home users and will no doubt last them a good few years before a replacement is needed.

Brother MFC-J4620DW

The Brother MFC-J4620DW is the most expensive printer in the group, but it's also the most functional and has the most features. The running costs are the cheapest as well, but the printer is designed with a SOHO user in mind, rather than casual home users.

If, however, you do a lot of high-quality and high-volume printing at home, then this could just be the printer for you.

How We Tested

Each printer was physically hooked up to a Windows 10 PC via USB, as well as connected to a home network where possible.

We ran a five-page full text print along with a five-page colour photo and a high-quality glossy photo. And where possible we tested printing from a smartphone or tablet. Printing costs are taken from Cartridgesave.co.uk based on a standard black and colour cartridge. We were unable to test the refill abilities of the printers in this case.

	HP Officejet 4630	HP Deskjet 1510	HP Envy 4507	Canon Pixma MG4250	Canon Pixma MX525	Brother MFC-J4620DW
Price	£60	£30	£50	£44	£69	£95
Dimensions	445 x 331 x 188mm	425 x 552 x 252mm	445 x 334 x 120mm	449 x 304 x 152mm	458 x 385 x 200mm	480 x 290 x 188mm
Weight	6.2kg	3.6kg	5.49kg	5.7kg	8.7kg	9.5kg
Connectivity	USB, wi-fi	USB	USB, wi-fi	USB, wi-fi, Card reader	USB, wi-fi, Ethernet	USB, wi-fi, Ethernet
Mobile Printing	Yes	No	Yes	Yes	Yes	Yes
Cloud Printing	No	No	No	Yes	Yes	Yes
Cost Of Standard Black Cartridge	£11.55	£11.55	£11.55	£13.56	£13.56	£16.71
Cost Of Standard Colour Cartridge	£11.16	£13.39	£13.39	£16.80	£16.80	£11.97
Cost Per Page Black	5.1 pence	5.1 pence	5.1 pence	6.2 pence	6.3 pence	3 pence
Cost Per Page Colour	6.8 pence	6.8 pence	6.8 pence	7.8 pence	7.8 pence	2.2 pence

Component Watch

We celebrate our Networking Special with some great Wireless AC adaptors

To tie in with our networking special, this week's Component Watch is going to take a look at the best prices for Wireless AC network adaptors on the market. Getting the fastest speeds out of your network is a two-way process, and while there's a more extension Wireless AC Router guide elsewhere in this issue, you also need a Wireless AC network card or USB adaptor to take full advantage of that. If you haven't got one, hopefully the prices here will convince you it's within reach!

Deal 1: TrendNET TEW-805UB
RRP: £38 / Deal Price: £16

It's already one of the cheapest Wireless AC adaptors out there, but the TrendNET TEW-805UB has had its price slashed several times recently. It's now reached a bargain status that means it's almost criminal not to buy it. It might look chunky, and it does literally stick out like a sore thumb, but its AC1200 speeds can make up for any irritation that might cause. Quite simply, it's the perfect entry-level piece of hardware for the Wireless AC-curious who want to give it a go without breaking the bank.
Where to get it: CCL (**bit.ly/1WSwJ7Q**)

Deal 2: TP-Link Archer T2UH
RRP: £35 / Deal Price: £20

Designed with a stronger connection in mind, the TP-Link Archer T2UH is a USB-powered wireless adaptor that can add 802.11AC functionality to your laptop or desktop system any time you like. It has a full-size antenna that allows high-speed, long-range connections of up to 600Mb/s, along with selectable dual-band connections that mean it's possible for you to find the best connection for high-speed video and gaming. WPS compatibility allows for a very simple one-touch setup process and, in addition to all of that, you also get a handy one metre USB extension cable packed into the box – so you will be able to position it for the best signal possible. Useful stuff!
Where to get it: Stuff-UK (**bit.ly/1hGk0VR**)

Deal 3: Linksys AE6000
RRP: £28 / Deal Price: £22

The Linksys AE6000 is a nice and compact Wireless AC adaptor with dual-band compatibility, but note that it only connects to one at a time, so you get either 430Mb/s connections on Wireless AC or 150Mb/s on Wireless N. Easy setup is available using the WPS button, and it's light, portable and widely compatible with many different systems. At this price, that's more than enough.
Where to get it: Ebuyer (**bit.ly/1kmRPbY**)

Deal 4: Asus USB-AC53
RRP: £56 / Deal Price: £40

As a formerly impressive, but overly-expensive, piece of hardware the fact that you can now get the Asus USB-AC53 for under £40 is a good one. The internal patch antennae offers wide coverage, while Asus' NetClip software helps you locate the optimum position. This adaptor even comes with a cabled cradle so that you don't have to have it sticking inconveniently out of a USB port and can position it independently of your system. The best Wireless AC USB adaptor you'll find, bar none.
Where to get it: Box (**bit.ly/1WSxjCD**)

Deal 5: Asus PCE-AC68
RRP: £80 / Deal Price: £70

If you're after a high-quality PCI network adaptor with Wireless AC support, you'll have to be prepared to pay for it. Wireless AC doesn't come cheap, and the size of the heatsink on the Asus PCE-AC68 should clue you in as to why this card's so expensive. There's a lot of power in there. Still, its triple antennae design gives it throughput of up to 1.3Gb/s, and there's even a detachable magnetic base so that you can move the aerials somewhere with better reception. Essential kit for those serious about high-speed networking.
Where to get it: Dabs (**bit.ly/1oPCKTf**)

The Download Directory

James Hunt scours the internet for the best freeware, shareware and paid-for application releases

This month, The Download Directory's collection of offbeat and largely unexplored applications includes WinCompose, a dedicated compose button for Windows; XMedia Recode, a video conversion application supporting almost every format; SyncBackSE, a file synchronisation program that allows you to keep your files in order; Tweak-10, a Windows tweaking program for Windows 10; and PicPick, a screen capture suite with built-in editing features.

WinCompose 0.7.4

Release Type: Open Source
Official Site: github.com/samhocevar/wincompose

Inserting special characters into tweets, documents and Facebook posts is incredibly easy if you're doing it on a mobile device, but if you have a physical keyboard in front of you it can mean resorting to a Byzantine expression of keypresses which, by the time you've looked it up, will mean you've probably forgotten what you wanted to type anyway.

WinCompose is an applet designed to get around this problem by adding a 'compose' key to Windows, which gives you an easy way to insert special characters and symbols into any Windows interface.

When the program is launched, it adds an icon to your system tray and can be triggered when you press the designated 'compose' key. By default, that's Alt Gr, but you can select it to be anything convenient (if, by some dumb luck, you're the one person in the world who still uses Alt Gr for anything). To insert the character of your choice, you then simply type whatever short code has been set up for it.

So, say you want to add a heart emoji into a document. All you have to do is press Alt Gr and type '<3' – though you could also change it so you type 'heart', if that's easier. There are 1,700 rules supported by default, and you can add and change them all to suit your preference. The only thing that comes close to being this useful in Windows is character map, and even that's more of a hassle than WinCompose.

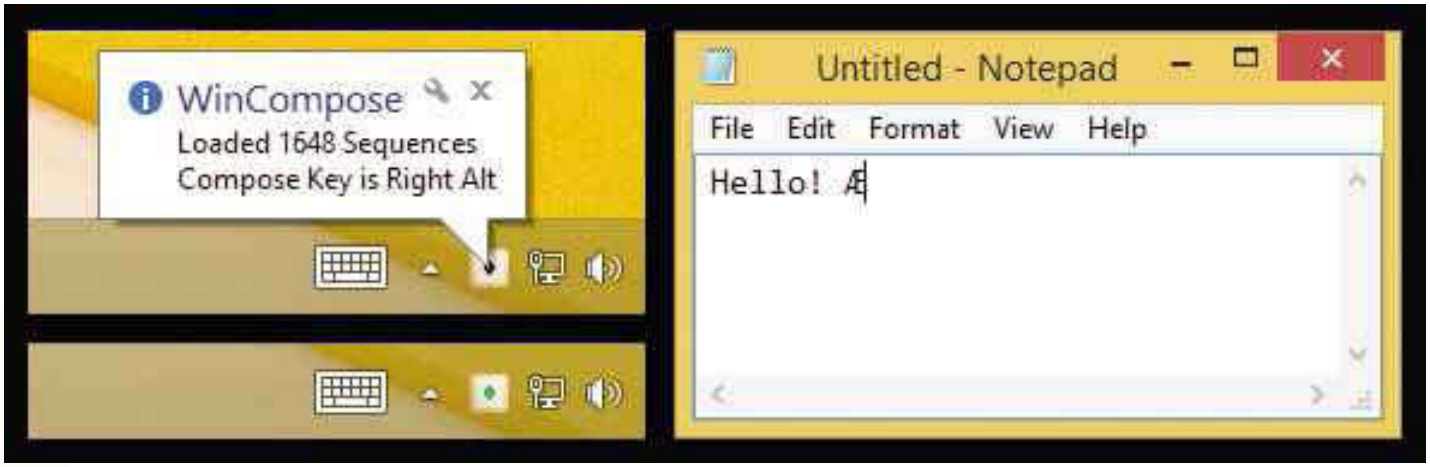
Although it's not yet complete, in that it hasn't reached version 1.0, we find it hard to imagine what's missing from this version that could be added in future. It's simple, lightweight, hugely configurable and completely effective at the same time. If you lament the difficulty of accessing special characters from your keyboard, your problems might just be over.

Pros: Beautifully streamlined app.
Cons: Not finished yet – whatever that means.
Rating: 5/5

XMedia Recode 3.2.5.5

Release Type: Freeware
Official Site: www.xmedia-recode.de

Switching video formats around is one of the more punishing tasks that face modern PC users, usually because of the sheer quantity of codec conflicts and application settings that can come to the fore. But until



such time as the PlayStation 4, Xbox One and Apple TV all agree what sort of video to use, sometimes you won't have any other choice.

In those circumstances, XMedia Recode might be the program you need. An audio-video conversion tool supporting basically every format you can imagine, from MP4 to FLV to RMVB, it's exactly what you need to turn videos into something that'll work on any device.

High compatibility isn't its only advantage; there are tons of options to delve into, and while that might make it daunting for casual users, there are presets that can help you convert for a specific device or service. Choosing them will automatically put the settings in the optimum place, ensuring everything from the resolution to the filesize to the particular type of interlacing are correct. If you prefer to exercise more control, you can go deeper than most applications will allow: you don't just choose to scale video down, you choose exactly what type of algorithm you want to use to do so. It's that granular.

There is one major problem with XMedia Recode, however, and it's one that makes it significantly difficult to use: the translation isn't quite done. There are German words littered everywhere, and in particular the help documentation isn't available in any other language. If you're the sort of person who likes a program's help files to be comprehensible (let alone useful), then you're out of luck. Similarly, if you aren't at least confident in your ability to understand two languages, it's not a great situation.

Despite this, the program is pretty good at what it does, provided you can get over that hurdle. We wouldn't thrust it on a beginner, but if you're at least partially competent with video editing, you should be able to get it together long enough to work out what's going on.

Pros: Powerful, but accessible to beginners...
Cons: ...as long as you can read German.
Rating: 3/5

SyncBackSE 7.3.4.0

Release Type: Trialware
Official Site: www.2brightsparks.com

Multi-device lifestyles mean that file-synchronisation programs are hugely popular these days, though most of them rely on the cloud to work. What if you're after something a little more secure or a little different from the glut of Dropbox clones out there?

SyncBack SE might be the software that fits that description. It's a backup and synchronisation tool, which works over a number of different formats, allowing you to mirror directories to removable media, network shares, FTP servers and more. The process works in one or two directions, and you can customise a profile for each type of device, allowing you to copy specific files or directories to specific locations in a super-fast and streamlined manner. Conflicts are well-handled, and at the end of the process you can be sure your two directories have exactly the same contents.

Two modes are available: a simple mode for basic copying and synchronisation, and an expert mode for more complicated circumstances. The latter allows you to configure certain backup triggers – so you might manually fire off the process once you've completed a certain piece of work, or ask that it begins copying a backup automatically whenever you insert a particular drive.

The trial build of the software runs for 30 days without any restriction, but after that it costs around £30 to use, which is a fair price for an application with this many features if not a particularly good one. The documentation is high quality, with a comprehensive help file, a large online knowledge base and a community forum. On the plus side, development is very active and Windows 10 support is there in full, so you can be sure if you pay the money you're getting a decent service for your money.

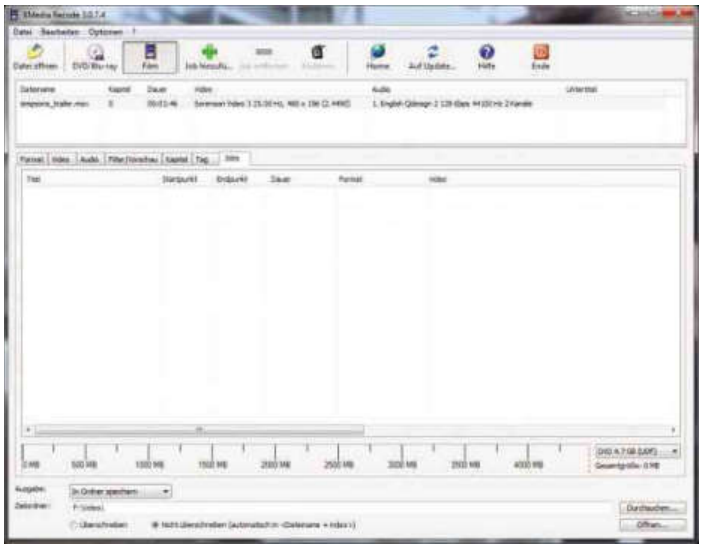
Pros: Full backup service, good coverage for all users.
Cons: Quite expensive.
Rating: 4/5

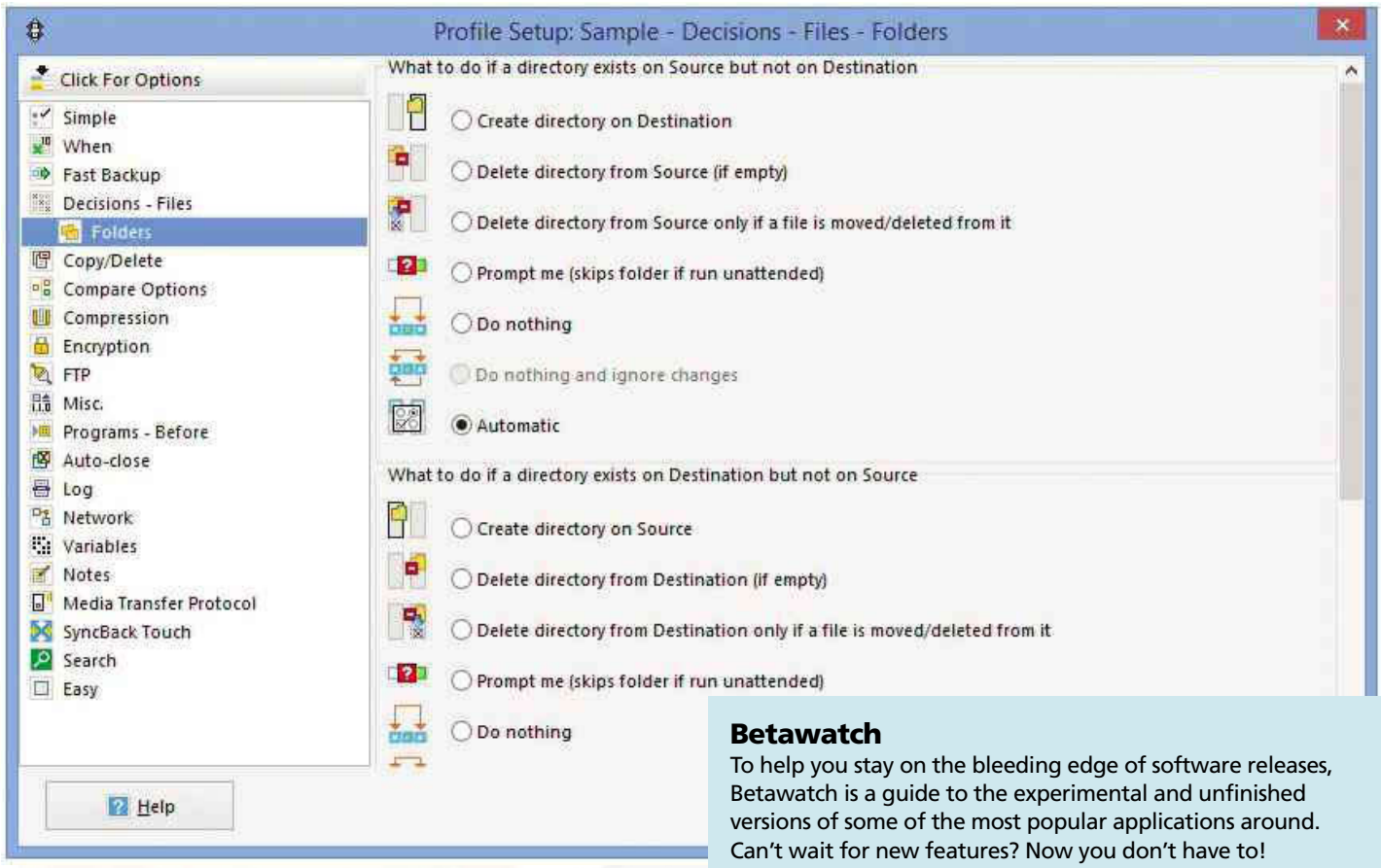
Tweak-10 v1.0.1007

Release Type: Limited Demo
Official Site: www.totalidea.com

Windows-tweaking applications are a particular favourite here at The Download Directory, so it's always good to see someone has taken the time to build one for Windows 10 already. A selection of tools for customising, optimising, and otherwise refining the Windows 10 experience, you might wonder how many chances to do that have even been discovered when the program's barely been available for a month.

Well, clearly that hasn't stopped the developer in its tracks. A tabbed interface contains plenty of Windows 10 tweaks to pick from, groups





under categories like 'System Info', 'Visual Tweaks' and 'Network + Internet'. Sorting through the various options, you'll find everything from a junk file cleaner to a start-up manager. Some of the options look a little suspicious (we're always wary of registry cleaners, for instance), and others aren't available in the free trial (auto optimiser, we shall never know what you actually do, if anything), but in general there's a lot to get on with.

The tweaking options are what really make the software interesting, though. Add and remove items to the Explorer menu, customise the toolbar and Start menu, fine-tune security settings. There's a lot of good stuff in here. It harms the program's case that it's present alongside some generally useless options, whose credibility has long-since been debunked: prefetch deletion and Windows QoS tweak, we're looking at you.

At £16 per copy for the full unlocked version, we're not entirely convinced that it does enough to justify its price, however. This is the sort of application you'd be happy chucking a few quid at through Paypal by way of a tip, but the demo version doesn't make it seem remotely essential – especially when you learn that the licence isn't perpetual but annually renewable.

This might be the sort of program that could justify £16 on its own if there were free updates and improvements for life, but give it a month or two and free alternatives will be coming out of the woodwork, probably with a little more credibility. It's not the worst example of its kind that we've ever seen, but it could be a lot better and a lot cheaper, and that means it's not making our list of recommendations any time soon.

Pros: Lots of useful tweaks even though Windows 10 is quite new.
Cons: An expensive, limited licence and inclusion of discredited tweaks harm its appeal.
Rating: 2/5

Betawatch

To help you stay on the bleeding edge of software releases, Betawatch is a guide to the experimental and unfinished versions of some of the most popular applications around. Can't wait for new features? Now you don't have to!

Version 41.0 beta

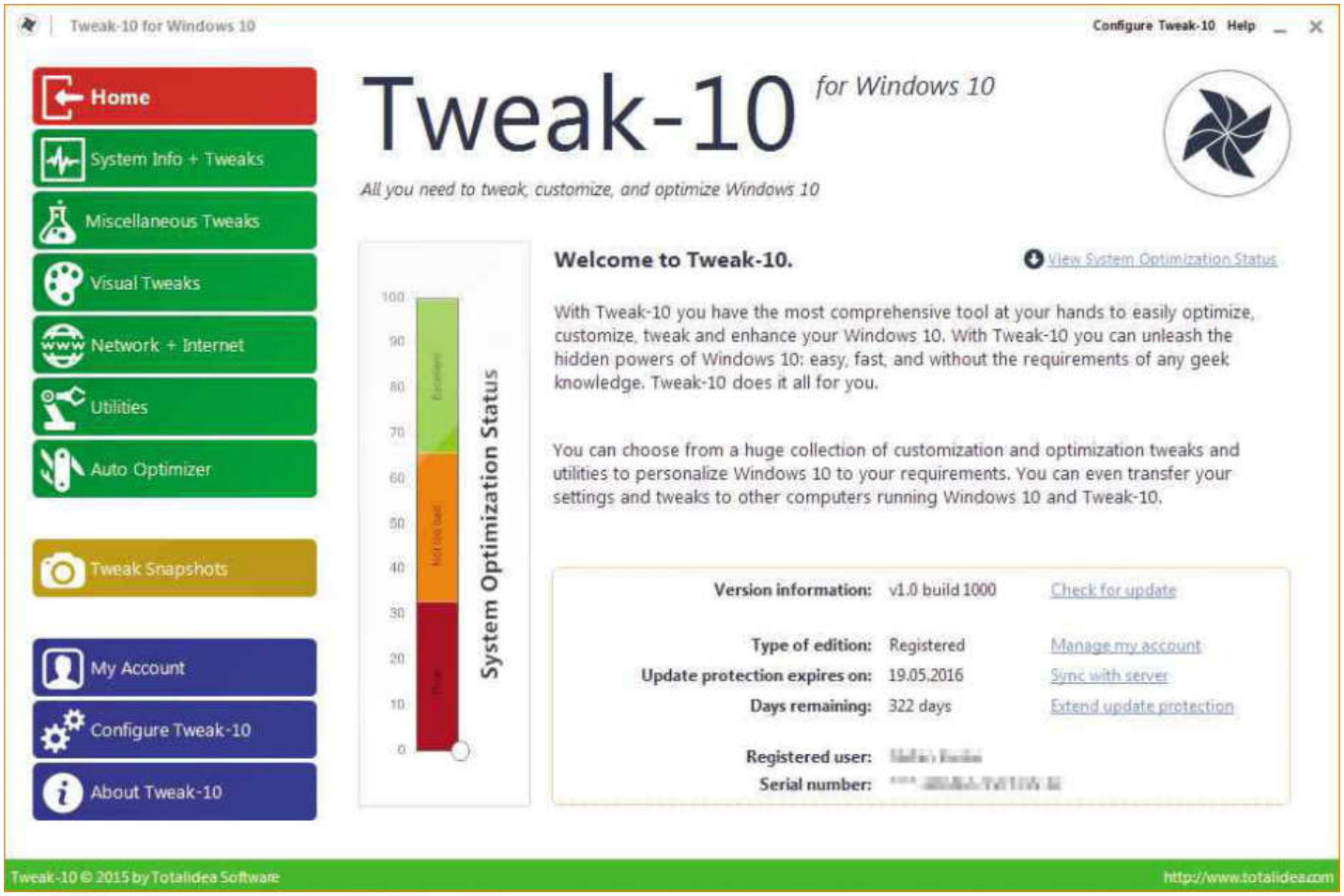
www.mozilla.org/en-US/firefox/41.0beta/releasenotes

It's been a few months since we looked at the latest Firefox beta, and that encompasses the release of Windows 10, so understandably a lot has gone on since then. Version 41.0 is probably due out any day now, but if you're interested in what the beta version has to offer you, here's the good stuff.

Support for Windows 10 has been completed and included (as you may know if you've installed it on Windows 10). SVG images can now be used as Favicons in addition to JPG and PNG. Firefox Hello now includes Instant Messaging properly. You can also set a picture to be used on your Firefox account. Image decoding has been improved and now performs twice as fast on some devices – especially while the page is scrolling – and asynchronous animations have been implemented for smoother and more reliable CSS. And JPEGs use less memory when scaled.

Plug-in changes include unsigned extensions being disabled by default and a set of changes that severely reduce the memory overheads of AdBlock Plus. HTML5 changes include the ability to cut and copy content from JavaScript and improved support for SVG transforms. In addition to these things, there's also a host of developer updates and changes, which are useful if you're building complex web pages, but since many of you aren't, we'll leave that to the developers to spot.

As ever, you can download the beta version of Firefox from the link above or switch to the beta channel for an advance look at the features that are available. There's a small risk of bugs and errors, but in several years we've never encountered one, so we're confident that it's worth doing!



ReDownloaded

This month, in our regular retrospective section, we're looking back at the September 2013 instalment of Download Directory to see how the programs we reviewed have fared. Are they better? Worse? Gone completely? Here, we find out.

f.lux

justgetflux.com
Reviewed Version: 3.9, Current Version: 3.10

F.lux is a program that tints your screen red at night to eliminate (or at least, reduce) the blue light that is believed to trick your circadian rhythms into thinking it's still day, so late nights at the computer don't leave you awake until the small hours. Whether or not it works, the program is hugely well built, and although it hasn't updated much since we last looked at it, this is one case where we can absolutely forgive that – the program was already perfect already, and the active blog shows that the software hasn't been abandoned.

Fast Shutdown

www.myportablesoftware.com/fastshutdown.aspx
Reviewed Version: 1.0, Current Version: 1.0

If there's a lesson we're learning this month, it's that sometimes programs stop updating and that's fine. Two years ago, the notion of adding a shutdown button to Windows 8 was something everyone saw the logic of, not least because Windows itself had decided all computers should remain switch on forever. The program did its job, and now Windows 10 has made that process as simple as it needs to be once again, there's no longer any great need for it. But hey, if you still want it, at least it's there.

Windows Repair (All in One)

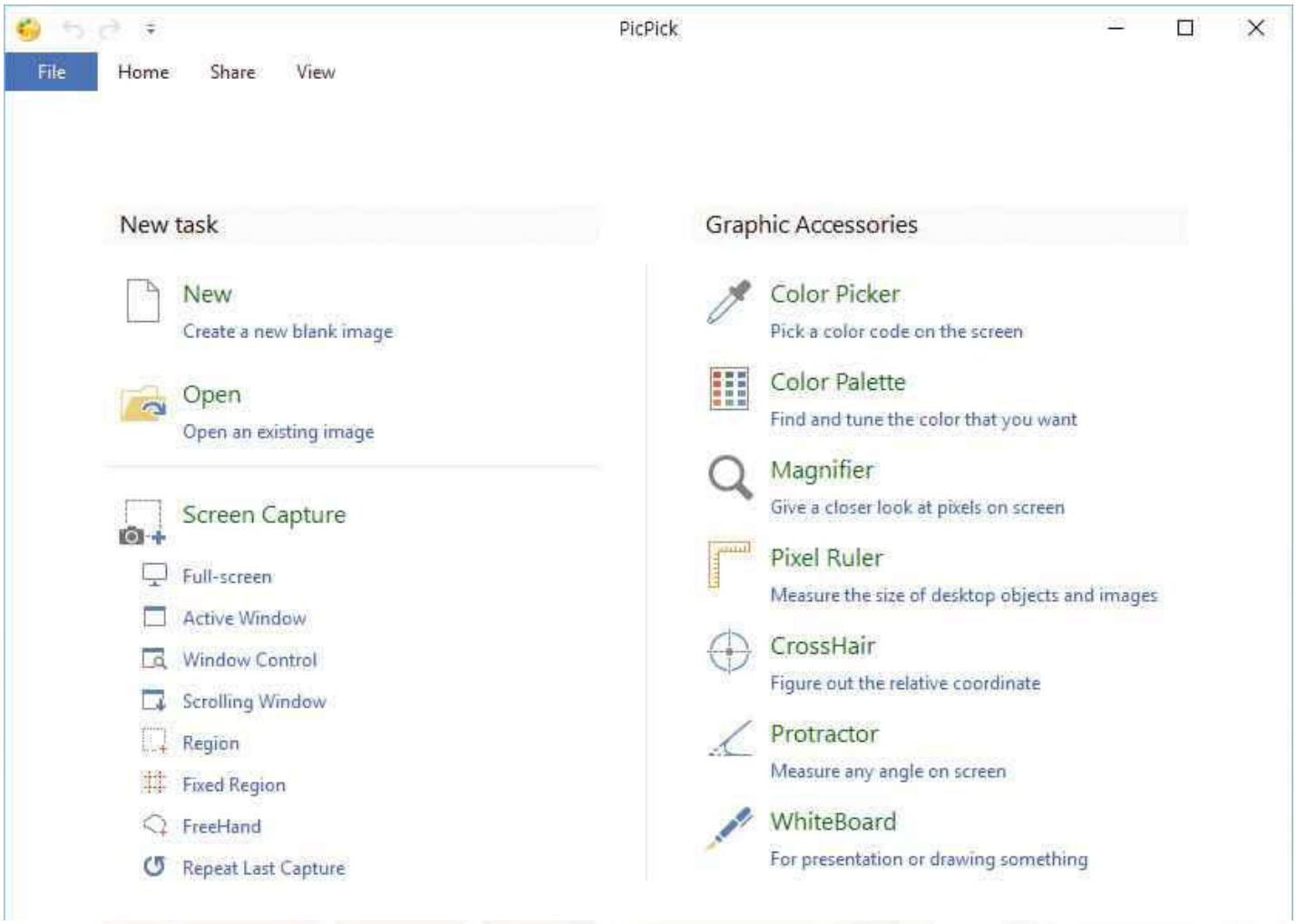
www.tweaking.com
Reviewed Version: 2.0.1, Current Version: 3.4.3

All that said, it's nice when a program does keep updating. And this once has done that. A Windows-repair app with hundreds of potential solutions, it's nice that the developer kept going with it, making it only more useful in the years since. Of course, it's still unreasonably text-heavy and crowded. A new design would have probably gone further than new features. But hey, there's still time.

Icomancer

www.lavasoftworks.com/icomancer/index.html
Reviewed Version: 1.3.4, Current Version: 1.3.5

And finally, Icomancer is one program that should have come further than it has. The original version of this custom-icon organiser had a truly hideous design, and that's still the case. The only update – from February this year – wasn't even to add Windows 10 support. So while it's not technically abandoned, it has probably been left behind by users rather than developers – and it was hardly essentially software even at the time.



PicPick 4.0.7

Release Type: Shareware
Official Site: ngwin.com/picpick

The Snipping Tool in recent versions of Windows has gone some way to make taking screenshots slightly less laborious, but Windows' graphics-editing capabilities are still well below the standard most people actually need out of their software. And if, like us, you spend a lot of time taking screenshots of varying size and focus, you really need a program that can automate at least part of that process.

PicPick actually goes a step further than automation and attempts to incorporate an image editor as well. You can use it to capture full screen, windows, individual controls, the full height of a scrolling window, a specific screen region and even a freehand drawn area. Hotkeys can be applied to each of these, so you can trigger multiple types of capture within a single session. That alone makes it more powerful and useful than a huge number of capture programs.

But further to that is the ability to then process those images immediately. You can upload the picture straight to Facebook, Twitter, Dropbox or even an online FTP server. You can email them, copy them into Office documents, send them to the printer or straight to a file. And if none of those options sound helpful to you, the other option is to send them straight to PicPick's built-in image editor, which is a reasonably fully featured piece of software in itself. We're not talking Adobe Photoshop, but it's certainly no worse than Windows Paint.

Image-editing tools include cropping, resizing, rotating, freehand painting and drawing tools, text caption editor, colour and brightness tweaks, frame addition and special effects filters like blur, sharpen, grayscale and more. The program also incorporates other useful tools, like a colour picker, screen magnifier, pixel ruler – even a protractor. There's a whiteboard function designed for use during presentations too.

The most impressive part of the program is its small footprint. Despite all this, the program takes up a tiny amount of RAM in the order of megabytes, which makes gigabyte-size behemoths like Firefox look as excessive as they really are. And on top of all that, it's a completely portable program.

This level of quality does come at a price, and that's very specifically $21.99 (+VAT) for a single user, two-machine licence. If you take a lot of screenshots, we don't think that's an unreasonable price. But the good news is that unless you're using the program in a business or commercial environment, you're not even required to pay it. So while it isn't technically free, as far as most people are concerned, it might as well be.

Pros: Tons of features, free for personal use.
Cons: Image editor could be more complicated, but we're just nitpicking with that.
Rating: 5/5

So there you have it! A fantastic collection of programs this month, all of which earned the high ratings they deserve. Remember, if you have any programs that you'd like to see us look at – whether it's something you want to find, something you like and want to share or even a program you've written and want us to review – don't hang around. Get in touch, and we'll make sure it ends up in the download directories everywhere – courtesy of The Download Directory! **mm**

Remembering... Windows 95

Since it's just turned 20, we thought we'd look back at a defining OS

DOS 6.22 and Windows 3.11 were a great combination. We could have the best of DOS gaming, while still being able to type 'win' into the command prompt and get a fully functional GUI to type out that college essay. It worked, and it was an easy setup to fix if anything ever went wrong, which it rarely did. Then Microsoft went and released Windows 95.

Windows 95 was totally different to those of us who were used to the whole DOS and 3.11 combo. It looked radically different, it behaved in a completely different way from what we were used to and created a new set of problems and potential fixes that we never thought were possible previously.

It was a strange thing to behold, the Windows 95 desktop when you saw it for the first time. Those of us who had previously used Atari STs and Amigas saw some familiarity to the OS and the way it behaved. Of course, we were also used to Windows 3.11, and we were young enough to simply accept that things were going to be very different from this moment on.

Windows 95 wasn't all that bad. Sure it had a few problems, and it did crash a fair amount – much more than Windows 3.11 ever did (from my point of view, anyway), but with things like a Start button and menu, it represented the future of what desktops would look like on PC for the next 20 years.

Its History

Windows 95, codenamed Chicago, started life in 1992 as part of a revolutionary new desktop and OS design from deep within Microsoft.

The company needed to start shipping a 32-bit operating system to keep up with the likes OS/2 and what Apple was up to at the time. Interestingly, it was due for a 1993 release and was going to be called Windows 93. There was even going to be a version of Windows 93 with a complementary copy of DOS 7.0 as an operating system installation for older machines that weren't able to run the new desktop OS.

However, things were changed around a bit, and as a result Windows 95 came into being with DOS as its underlying base system.

Did You Know?

- You can run Windows 95 from within your browser by going to goo.gl/5eSZIi.
- The CD version had a video of Weezer's 'Buddy Holly'.
- Brian Eno composed the Windows 95 start-up chime.
- It sold 40-million copies in the first year alone.

This method did have some users scratching their heads, as you could load up the DOS portion of Windows 95 without it ever going into the GUI. So in some ways, Windows 95 wasn't all that different in its operation to DOS 6.22 and Windows 3.11.

Once you loaded the GUI, though, the memory management took over, and you were able to launch both 16- and 32-bit programs thanks to the Win32 API.

The new OS brought support for long filenames, Internet Explorer, Active Desktop and a much improved network file structure, not to mention Plug and Play (when it worked). It was quite radical, but to begin with, a bit of a nightmare.

Although new, the first release of Windows 95 didn't support FAT32, AGP, USB or UDMA, and it was buggy with MMX processors. It took until Service Release 2 the following year before all the problems were finally addressed and supported.

The Good

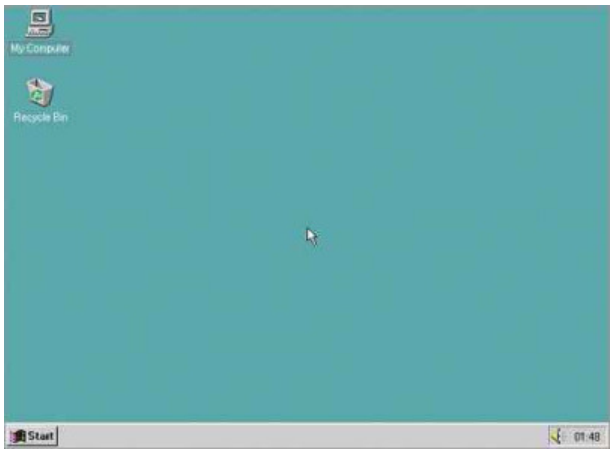
A quantum leap in design, and the way it performed was astonishing.

The Bad

Poor support for hardware to begin with. The Briefcase.

Conclusion

Windows 95 ended up being a great OS that was finally succeeded by the even better Windows 98. It was the first step in a brave new world and a fond farewell to the old DOS days.



The Windows 95 desktop was such a radical new design

Despite the occasional crash, Windows 95 was a great OS

RETRO ROUND-UP

The Sinclair ZX Vega hits the high street, bringing old and new Spectrum games to the masses. Dave Edwards investigates just how much of an impact it will have

Halfway through writing this month's Retro Round Up, my shiny new Sinclair ZX Vega arrived. 'Comes preloaded,' its packaging exclaimed, 'with 1,000 games.' Oddly, though, there was no mention on the packaging or the official Vega website (**www.zxvega.co.uk**) of what those 1,000 games actually were… and it's fair to say I was extremely surprised to find out!

The Vega, in case you don't yet know, is a plug-and-play-via-Scart mini-Spectrum, so after plugging it in and with some bemusement, I began paging through the on-screen menus searching for my favourite Spectrum games of yesteryear. *Hunchback*? Nope. *Rainbow Islands*, maybe? Nada. Ah well, surely *Manic Miner*, the game that defined the Spectrum generation and launched a thousand clones, would be there, right? Wrong, also not included.

And yet I did recognise the titles of many of the Spectrum games therein, and regular readers of this column will do too: *LaLa Prologue*, *Zombie Calavera*, *Phantomas Tales*, *Quantum Gardening*, *Battery's Not Precluded*… In short, the ZX Vega features practically an even split between games of the 80s, the 90s, the noughties and the present day.

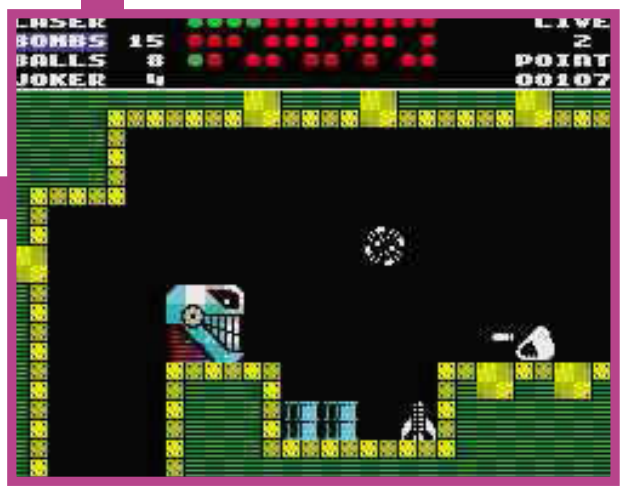
The strangely alluring addition to the ZX Spectrum family

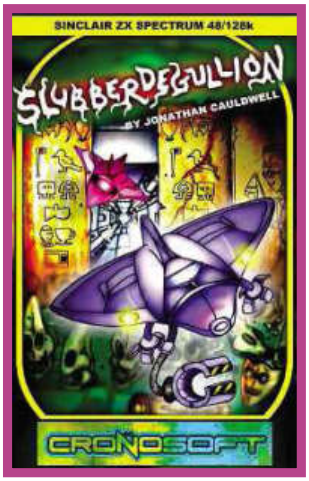
The experience was quite curious. Don't get me wrong – some of the very best software for the Spectrum is, of course, being written and published right now. I raved about Cronosoft's *Egghead Round The Med* and *Splattr* in Micro Mart #1346; the Vega includes both. However, writing about them at that time felt like exposing to a wider audience some extremely niche software, available in quite limited supply. Until the launch of the Vega, you would also have been destined to pay out individually for most of the high-quality titles this column has covered (by ordering them from the likes of Cronosoft, Monument or RetroWorks). Whether by means of digital download or physical cassette, for many of these new titles, this has been the only way to get them.

However, by way of the Vega, these self-same games have suddenly gone global: they are about to be played by

RetroWorks' packaging is simple but effective

When the wall features protrusions, the cannonballs will slide off these first, so accurate aiming is necessary





That maniac grin reminds me of a girl I once went out with...

tens of thousands of people – everyone, in fact, who buys the Vega. So if you have regularly read the retro columns of Micro Mart but been dissuaded from playing at least the latest Spectrum game by the need to haul your Speccy out of the attic (or fire up an emulator on your PC) – not to mention pay the standard £4.99 that each game usually cost! – you can now simply invest in a Vega instead and, at a stroke, get almost every game I've thus far covered. The box might make no mention of them, but practically the games from the entire Cronosoft, Monument and RetroWorks catalogues are included on the Vega in their entirety!

Wow indeed. Brand new Vegas are currently changing hands on eBay for just £100. That's the equivalent of 10p per game! I also expect that, if Argos decides to distribute it this Christmas, its price will be a lot lower. Wow again.

And yet… there's something a tad peculiar about this handheld Spectrum including such a wealth of brand new Spectrum games. First is the blindingly obvious fact that, as I found out instantly, the games you played on your actual Spectrum as a teenager aren't there. I think it's a reasonable assumption on the part of most buyers that they should be. To have the new console without them is like publishing a 'Sega Mega Drive Collection' on which the bulk of games didn't even exist in the era of the Sega Mega Drive.

Secondly, for the publishers of modern Spectrum games, I would imagine the effect on orders for their wares will be devastating. There's little point sending off £12.99 to RetroWorks for *Brunilda* now. A few pounds more buys it, a Vega and 999 additional games too. As for Monument Microgames, which was on the verge of releasing physical versions of *Megaman X Reloaded*, *LaLa Prologue* and *Cray 5*, its site (**www.monumentmicrogames.com**) is suddenly as empty as the Vega is full!

The Vega is certainly an amazing product, but it must surely affect whether such companies feel it is still worthwhile now to produce those games it includes on physical cassette.

Gommy, Medieval Defender

An immediate case in point is *Gommy, Medieval Defender*, a new cassette-based game for the Spectrum 128K only by RetroWorks. Your mission is to defend Gommy's castle by dropping cannonballs onto the marauders scaling its walls. It's a 'survive-as-long-as-you-can' affair that's made significantly harder than it should be by colours that clash in that peculiar Spectrum game way.

As you clear each castle wall of would-be looters, you will move onto a slightly more difficult one. The screens are made harder by protrusions from the wall itself, meaning your enemies can shield themselves from your projectiles. In addition, as protrusions increase, you need to put a little more thought into where to launch cannonballs from in the first place.

It's a simple idea and a very playable game, spruced up by groovy background music. The colour clash means you have to squint to see it properly, though, which almost makes me wish RetroWorks had sacrificed the colour and instead programmed it only in monochrome.

Gommy, Medieval Defender can be downloaded for free from **www.retroworks.es** (where you'll also find a version for the MSX too!), bought on cassette from **www.sellmyretro.com** (£5) and/or played on the ZX Vega, where it comes included.

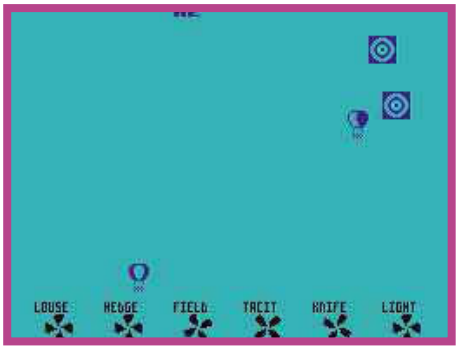
Slubberdegullion

Slubberdegullion probably isn't the first time a graphic adventure has been paired up with rotational controls, physics and inertia, but there aren't too many games in such a genre and, more surprisingly, it really works.

Your mission is to get through a cavern complex by angling your craft so its nose points the way you want to go, and then thrust in that direction. You need to avoid both everything that moves and the bullets from wall-mounted gun turrets. Something I quite like is that you don't have to avoid the walls, so you can rest against these – very helpful when you need to take aim at everything else!

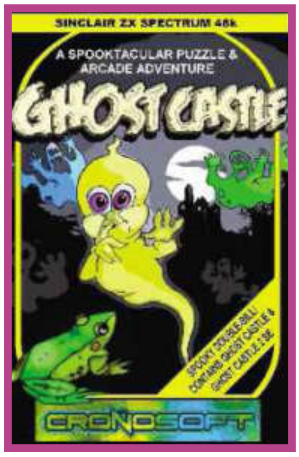
You have three separate weapons: missiles, bombs and two pinballs, which can be released to ricochet around each cavern. You have to switch between each of these with one control key and fire with another. The bad guys do seem to be very adept, however, at avoiding all three of them.

Yes, good things can come in bad packaging



Fascinating mini-games involve everything from shooting bandits to operating hand-fans

Originally released in 2010, the first Ghost Castle is a frustrating puzzle game



But the new remix is a Sabre Wulf style game, and all the better for it

Slubberdegullion is a neat, surprisingly different idea, which successfully fuses together two different game genres. Very smoothly done in all respects, it's available from Cronosoft as a digital download (£1.99), as a physical cassette (£3.99) and/or can also be played on the ZX Vega, where it comes included.

Utter Tripe

I don't load games blind. I read about them first so I have an idea of what to expect. *Utter Tripe* has instructions, but they're incomprehensible – utter tripe, in fact. Thanks, Cronosoft, that's two minutes of my life I can't reclaim.

Thankfully, *Utter Tripe* is a lot better than its name suggests, and its befuddling instructions are part of the whole mysterious ensemble. You're not meant to know what to do when you begin, and the screen being filled with total nonsense when you do so is only meant to intrigue you further.

That of course means that before I go any further, I have to shout 'Spoiler Alert!'. If you want to experience *Utter Tripe* at its weirdest, glorious best then you've now read all you need to. Play it and then come back only once you've gathered your thoughts.

Back already? Well, don't say I ruined it for you. As you might have guessed, *Utter Tripe* is a very 'different' type of game. Apart from the rare Dreamcast title The *Typing Of The Dead*, I've never seen anything quite like it. It's more of a compilation of mini-games rather than a single one, and it's actually very difficult to do it justice in print because I haven't seen all of those mini-games, and each of these games is unique in its own right, and I can't cover them all.

If you dive straight in, the first 'task' you're given is to 'promote a pawn' on an overhead chessboard, featuring eight of your pawns and two nasty patrolling knights. However, your pawns are labelled with words, and to move one of them, you must type in the corresponding word for that piece and press Enter. Time the keypress well and it'll skip past those marauding knights and gain you a 'Pass'. You'll then proceed to another task.

Tasks are diverse indeed. Word-denoted footballs are lined up in front of a goal and a ducking and diving goalie. Targets hang in space, and words operate fans to blow balloons into them. Maths questions need to be answered with the word that denotes the correct number. There's even the demijohn from *Homebrew* (See Micro Mart #1362) squeezed in there with words to drop the fruits instead of a barrel!

And is it any good? Yes, it's superb. Doubly so too, if you're a gamer with a limited attention span. Don't like the current 'task'? Don't stress: in 20 seconds it'll be replaced by something different. Tasks aren't always easy either; the word 'Fail' will deduct one of your lives before proceeding if you're not up to them.

I've lost count of the number of new Spectrum games I've seen by Jonathan Cauldwell, and the man clearly has the imagination of a superhero to keep churning these original ideas out at such rate and quality. Available from Cronosoft as a digital download (£1.99) and/or as a physical cassette (£3.99).

Ghost Castle Double Pack

Finally, we come to the *Ghost Castle Double Pack*, which is a 'remastering' of two Spectrum public domain titles and comes supplied on a double-sided cassette from Cronosoft.

The original *Ghost Castle* is a maze puzzle game, which consists of a number of themed screens. In each one, you're charged with collecting objects to make progress and finally exiting through a blue door.

The levels need to be completed in exactly the same way every time you play, because if you don't collect objects in the correct order, you wind up unable to get any further and need to quit. If you find a yellow key, for example, it will open one of the two yellow doors before disappearing. If one room contains only one object and the other an object and another yellow key, you want to do the second one first.

The big problem with *Ghost Castle*, though, is its terrible game controls. Patrolling nasties need to be avoided on most screens, but your character will often travel one step

In the 80s, Jeff Minter really didn't have any idea what he was starting...

Llama versus Sheep. Tough call

too far in your chosen direction. This makes the game seem clunky and basic; the nasties do not patrol as such, but rather sprites 'leap' from one 8x8 location to the next. The same effect also occurs if you move somewhere that scrolls the screen.

Thankfully, the second game in the pack, *Ghost Castle 2,* is a sequel that shares only its main sprite with the first game. You're now placed in a colourful maze frequented by two beasties per screen. If you exit left, you enter another screen on the right, and you can fire in any one of eight directions to clear the way before you.

It's rare that a sequel differs in almost every respect from the original, so fans expecting another keys and doors-based puzzle game might actually be disappointed. Indeed, *Ghost Castle 2* has more in common with Ultimate classic *Sabre Wulf* than its prequel. Come to mention it, the game all looks very jungle-esque too. I'm not sure where the 'castle' of the title fits in at all!

Not that I'm complaining; *Ghost Castle 2* is a lot more enjoyable than the first and a lot less frustrating. You're given three lives and an energy bar for all three of them, meaning you can see a fair amount of the game before you inevitably bite the dust. Graphics are good, and your character, instead of the plodding dufus of *Ghost Castle*, is very responsive. There's little not to like here in fact.

Available from Cronosoft as a digital download (£1.99) and/or as a physical cassette (£3.99).

Sheepoid

Just time to squeeze in another C64 release, *Sheepoid*, which is available from Psytronik (**www.psytronik.net**). *Sheepoid* takes place on a single screen and you have control of two 'sheepoid' lasers: one at the bottom of the screen that moves left and right, and another on the extreme right that moves up and down. The catch is that the fire button operates them both, sending a blast both up and across (right to left) the arena they border.

This arena, known as the neon vortex, is a manic place. Empty at first, it slowly fills with enemies, whose one objective is to avoid your blasts for long enough to plough into one of your 'sheepoid' guns, wiping out one of your lives. Were this the only challenge, indiscriminate blasting would put paid to their plans without much thought.

The situation is complicated, however, by the baby sheep who also wander the vortex and who reduce your score when they come to any harm. And so, after all, that vortex is actually pretty difficult to clear because, just as you line up that vertical hand-sheepoid-cannon perfectly, a stray sheep will wander in front of the horizontal one! Bahhh, indeed.

Sheepoid is a loud bomb of a game; it even includes an epilepsy warning. Impacts cause flashes, and exploding enemies beget trance-like effects, much like the celebrated Jeff Minter 'Llamasoft' games of old. This inspiration could not be more clear. Llamasoft produced *Attack Of The Mutant Camels*, and level two's nemeses are mutant camels.

Personally, *Sheepoid* is a bit too mindless for my liking. Psytronik has produced better games than this, and it doesn't offer much in addition to the Minter games it dutifully pays homage to. Presumably it was made by fans for fans – and they're the ones who will snap it up! That said, it all fits together quite well for just £4.99 on cassette or 5.25" disk (Both have the superb Psytronik packaging that comes as standard.) If you opt for disk, you also get four bonus games that can be called up from the main menu. I don't have the space to review each of these in full, but for sure *Bionic Granny Returns* is an interesting way to kill five minutes.

And Finally, The Vega Verdict...

The sheer number of games the Vega includes – every game worthy of an individual review in its own right – has given me a little pause for thought in relation to next month's column. I don't want the column to simply be the equivalent of a review of 'yet more games on the Vega' each issue, and yet it is such a fantastically important retro product that as soon as I began to use it, it was inevitable that it would affect the column in a big way. It's a real 'game-changer' product, in fact, potentially introducing the Spectrum to a whole new generation.

It's too early to tell if the Vega will prove commercially successful enough that other companies consider variants that bring MSX, Amstrad or Acorn games back to our television sets. If you have even a passing interest in retro games, however, I think it should be considered an essential purchase. **mm**

Retro Computers (www.zxvega.co.uk)		
ZX Vega	Plug-and-play console	£100
Cronosoft (www.cronosoft.co.uk)		
Ghost Castle Double Pack	Spectrum 48K/128K	£3.99
Slubberdegullion*	Spectrum 48K/128K	£3.99
Utter Tripe	Spectrum 48K/128K	£3.99
Retro Works (www.retroworks.es)		
Gommy, Medieval Defender*	Spectrum 128K	£6.99
Psytronik (www.psytronik.net)		
Sheepoid	Commodore 64	£4.95
* denotes that this game is also included on the ZX Vega		

Gaming Laptops For All Budgets

If you need your gaming to be portable, but still want to play the latest releases, you'll need a laptop designed for the task

Most serious PC gamers spend a lot of time setting up their desktop systems; we're talking machines that include the best GPUs, tons of RAM and a powerful CPU, capable of playing the latest games at the highest detail with the best frame rates. It's almost an artform, and serving the needs of such demanding customers has always been to the forefront of the minds of those in the hardware industry, not least because of its a passionate community of early adopters.

However, one thing that this kind of PC gaming lacks is the ability to play anywhere, at any time. If you want to go around to a friend's for some LAN gaming, or just want to relax on the couch, it's not always an easy task. Desktop PCs just aren't portable. They're big, bulky, and restricted.

There is another option, one that grants access to the best PC games while also unshackling you from your desk: the laptop. Once the mainstay of the business world and those who wanted to work or communicate on the go, the humble laptop has grown in power from the limited device it once was. Now we have models that are more than capable of running the latest games, and some are even more powerful than some desktop alternatives.

If you're one of the increasing number of gamers who choose to switch to a more mobile gaming solution, or you think it may be for you, you'll probably be wondering what's available, and what you should be looking for in a gaming laptop – and that's what we're going to be covering over the next few pages.

We're going to look at the important things to look for in a gaming laptop, the differences between desktop and mobile gaming, and some of the best laptops around for various budgets. There are some pricey, but superb, options.

Laptop Vs Desktop

There's not really much an argument about which is the best way to play games on PC. Most would agree that the very best route to take to get the most out of gaming is a desktop machine. No matter how powerful a gaming laptop might be, a desktop model will almost always win in terms of sheer muscle and flexibility. They're bigger, they can handle more powerful hardware, and you can easily upgrade them. That's what they've been designed for, after all.

Laptops, on the other hand, are designed to be compact, mobile and more flexible in terms of actual, physical use. Due to their smaller build and reliance on battery power (when not connected to the mains), they often run slower, less powerful components, and their upgrade potential is far less impressive.

> **"Though a desktop PC may be the pinnacle of PC gaming, most users can play games perfectly well on a laptop"**

That said, the laptop market never ceases to fight for its gaming credentials. Even though a desktop PC may be the pinnacle of PC gaming, most users can play games perfectly well on a laptop, with the added benefits they provide.

As they're all-in-one units, there's no fuss when it comes to setting up, there's no need for a whole desk or office to set them up in, and you don't need to spend a lot of money on a monitor. It's all contained within the unit itself, a unit that can go anywhere, be it the lounge, a friend's house, or a Cafe. Laptops often look pretty snazzy too, so that's a bonus. That said, gaming laptops are often more expensive than an equivalent PC, so this has to be taken into account.

We've already mentioned the lack of customisation, though, and this is one area you really need to know about before choosing a gaming laptop. Laptops are specially built units designed in a very specific way. Unlike a desktop PC, which has plenty of room for expansion and is easy to open and tinker with, replacing parts as you see fit, laptops aren't as welcoming. Some are upgradable to a point, but most are limited, and the unit you buy is the unit you'll have until you get a new one, much like a games console. For this reason, it's important to choose wisely, and make sure the model you go for has everything you need, and enough muscle to last for a good while. There's no reason to shell out a hefty sum only to have to do so again in a year. So, let's have a look at the most important features of any gaming laptop, along with one of the biggest technical specifications, the GPU.

Onboard Graphics

We generally advise against onboard graphics for gaming, and this is for good reason. Onboard graphics just can't properly handle the latest games without some concessions. More shared resources are needed, in turn taking away from the rest of the system, and the available resources are limited as it is.

However, you can get away with onboard graphics if you're a more casual player, you'll just need to take the lesser power into account when installing and setting up your games, as well as the games you pick.

As onboard GPUs are limited, you'll almost always need to lower detail setting within games, such as lower screen and texture resolutions, disabling anti aliasing, turning off volumetric and real-time lighting, shadows, and more. Some games will simply allow you to set a low detail level, but most will let you tweak individual settings. Be selective with these, and you can usually improve performance in terms of speed and smoothness.

You should also pick your games with care. Although you may be tempted by beautiful games like *The Witcher 3*, it's not likely the game will look as good as the footage you've seen on such a setup, and you'll likely struggle with frame rate issues. For this reason, and the fact that most game stores won't refund PC games (mainly due to piracy, as PC games are easy to copy and return) it's always best to try demos before you buy any new games and see how they run. If a demo runs well, you should be okay. This isn't always true, and sometimes code and results can change from demo to full release, but it's usually a good guide.

Games that are less demanding in the visual stakes are going to be the best option. Titles like real time strategy, MMORPG's like World of Warcraft, and other genres that don't necessarily need to push graphical limits to the level of the latest tech, including, of course, older games and may indie titles that have a more retro aesthetic.

Power Box

Recently a new device has been revealed that uses Intel's Thunderbolt 3 USB 3.0 tech. This device, which makes full use of the increased power of this turbocharged USB 3.0 can be used to boost even the most visually challenged laptop into a graphical powerhouse.

This device will charge your laptop at the same time as providing the power to drive two 4K displays. Oh, and it can also power other USB devices too. Nice. The possibilities of this tech, only shown in prototype form thus far, are intriguing to say the least, so keep your eyes out for retail devices based on this.

Intel's Thunderbolt 3 tech could be a major step forward for mobile graphics as well as USB in general

Origin EON15-X

Essential Features

Gaming laptops may be built differently from desktop PCs, but most of the same specifications are just as relevant. It may be harder to satisfy a feature check-list due to the nature of a laptop's unique and specific build, but you really need to try to nail the majority of these features if you're going to have a laptop with legs.

First the main specifications, as these are by far the most important, and we'll start with the CPU. It's essential that you look for the most powerful CPU you can get in your price bracket. The CPU will be given a large workload when gaming, so you'll need a solid, multi-core CPU capable of handling this. Think at least Core i5 at the low end, and the best Core i7 if your budget can handle it. You can get AMD chips, of course, but the majority of the best gaming laptops focus on Intel's CPUs.

Next the GPU, and this is arguably just as important as your choice of CPU. It's also not as simple, as the kind of graphics card you pick isn't limited to model, but the GPU's format. Desktop PCs can have both onboard and dedicated graphics cards, and this also applies to laptops. Although you may think all laptop GPUs are onboard, given the lack of room, you'd be wrong. Laptops do come with both onboard, and dedicated GPUs, so it's important to keep a keen eye on this specification.

A gaming system really needs a dedicated GPU. Onboard model are usually far less powerful, and take up a share of memory and resources like other onboard hardware. To get the best performance from your games, this isn't the option for you. You need to look for laptops that have actual separate GPU chips; models from Nvidia, ATI and so on. These models should also be more powerful than the standard mobile versions of these companies' hardware. You should also ensure the card has at least 2GB VRAM. Higher-end laptops can have much more VRAM, so this shouldn't be a problem.

On the subject of RAM, the system RAM should also be taken care of, with at least 4-8GB of RAM fitted. Again, as with GPUs, you can get more, and you should do so if you can, but if you consider four as a minimum, you should be able to get in some serious gaming.

Storage is important, as many games are very large in size, and you'll also need fast storage for the best performance in game. Many swear by SSD drives, and if you can afford a laptop fitted with a large enough SSD, go for it. Otherwise, pick a unit that has 1-2TB of HDD storage, with higher 7200RPM speeds. Energy saving HDDs are great for economising your power usage, but they can throttle data transfer speeds as they often run more slowly.

The laptop screen is another very important feature, and one that's often overlooked as it's always part of the whole unit. People often focus solely on the under the hood specifications, ignoring this aspect. This is a shame, as the laptop display is just as important as a monitor or TV choice for gaming. You're going to be staring at it for prolonged periods don't forget, so you'll need a good quality display. Not only that, but the quality of the screen will also affect your gaming experience. Like PC monitors and TVs, you should make sure the screen has a good response rate, decent contrast, and a good viewing angle. It also needs a high gamut rating to better deliver the kind of colour detail you'll need when gaming. Screen size is also an issue. For gaming, you'll probably want a larger screen. Such laptops will tend to range from around 15-18". The larger the screen, the bigger the laptop, so if you go for the big picture, be prepared to carry a heavier, bulkier unit.

> **"The laptop's display is just as important as a monitor or TV choice for gaming"**

The actual build of the laptop is something to take into account. You'll obviously want a model that's portable and not too heavy. Most gaming laptops are larger and heavier than standard, everyday models, but there's still room to be picky. You should also make sure your model has a full keyboard, with cursors and a separate number pad, and plenty of inputs and outputs. The latter is important as you'll likely need to connect external storage, game controllers and other USB devices, and if properly equipped, you'll be able to connect multiple monitors to the unit, or connect it and output the display to a full-sized TV, giving you even more freedom. This can also overcome any shortcomings you may have in your laptop display. Look for VGA and HDMI outputs in particular.

Although laptops are notoriously difficult to upgrade in many ways, when it comes to RAM they're easy, so make sure that your model has plenty of extra capacity so you can give it a boost if needed. The more future-proof your laptop, the better, as it'll last you longer.

Aorus X7 Pro

▲ *MSI GT80 Titan*

Finally, let's consider power. There's no way around it, but laptop batteries, no matter how expensive your model may be, just aren't cut out for gaming or high-end use. Batteries used under such stress simply won't last long, and you'll be running out of juice very quickly. So, when getting into a serious session, you'll have to be connected to the mains, that's all there is to it. You could buy external power packs and even a UPS, but these, especially the latter, are large, cumbersome devices, and hardly contribute to portability. If you were to do this, you may as well strap your desktop PC and monitor to your back.

With all of that said, although they're never amazing, some laptops come with batteries that are longer-lasting than others, so it's worth checking this, as every bit of power helps when working or playing away from a mains supply.

These Are The Laptops You're Looking For

Now let's take a look at some of the more powerful examples around, including some that are a little more affordable, and some that represent the very best gaming laptops have to offer. Price will vary from vendor to vendor, so these are just guidelines.

Model: Origin EON15-X
Price: £1,600
The Origin EON15-X is an example of what can be achieved with great laptop design. This unit utilises a desktop-grade 4GHz Intel Core i7-4790K, with an Nvidia Geforce GTX980M 8GB GDDR5 RAM and an Intel HD Graphics 4600 onboard chip. There's also 8GB of system RAM, a 240GB SDD, 1TB HDD (5200RPM), and the screen is a 15.6" 1920x1080 LED.

It obvious, then, that this laptop packs plenty of punch. That powerful CPU/GPU combination is more than enough to handle most things. However, while it has a colourful back-lit keyboard to boost the aesthetics, the very limited viewing angle of the screen is the Origin EON15-X's most obvious drawback. It's a little on the heavy side too, but these are niggles in an otherwise great gaming laptop.

Model: Aorus X7 Pro
Price: £2,000
This is a bit of a beast, packing an Intel Core i7 4870 2.5GHz CPU and 16GB of RAM. The graphics are handled by an SLI pairing of two Geforce GTX 970M GPUs with a combined 6GB of VRAM. Storage includes a 1TB HDD (7200RPM) and two 256GB SSDs.

Yes, it's very pricey, but with the specs to back up its power, the Aorus X7 Pro is a desirable option for the seasoned gamer. It a bit loud, thanks to the cooling fans having a lot of work to do, but it'll handle all of your gaming sessions.

Model: MSI GT80 Titan 2QE
Price: £5,000
Yes, unfortunately you read the price correctly! This mammoth laptop will cost you around £5,000, making it one of the most expensive off-the-shelf laptops you'll find anywhere. It's silly money, we'll confess, but for this you get a very powerful gaming monster – and it's good to have a dream, right?

The CPU is a Core i7-5950HQ 3.7GHz, and it sits alongside 32GB DDR3L RAM, dual Nvidia Geforce GTX 980M 8GB GPUs, 2048GB RAID SSD main drive, 2TB SSD storage, and includes a Blu-ray writer.

▲ *Gigabyte P35K v3*

▲ *Asus G551JM*

It's on the ridiculous side of powerful in terms of specification, but in operation it's impressive to behold. It's easily capable of outperforming many desktop PCs but, of course, a downside to all that power (aside from that price) is it's size and weight. This is a bulky unit, so isn't the most portable laptop you'll ever see, and it's not really suited for constant travel.

This range from MSI comes in other guises too, with many more cheaper, but still powerful models, but this is amongst the highest end units, and a definite dream laptop.

Model: Gigabyte P35K v3
Price: £970

This is a fine example of a more budget-conscious option. It comes in at under £1,000, for which you get Intel's Core i7-4720 2.6GHz CPU, an Nvidia Geforce GTX 965M 4GB, Intel HD Graphics 4600, and 8GB of system RAM. For storage you get a 128GB SDD and a 1TB hard drive (7200RPM).

The build quality of the Gigabyte P35K v3 is also impressive for the price. It has a thin, relatively lightweight, frame and a very high quality IPS display. Although it's far cheaper than some of our other examples, it's more than able to run games at the highest settings, and is a perfect choice for gamers on a budget who want a powerful system that won't cost an arm and a leg.

Model: Acer Aspire V Nitro Black Edition
Price: £850

Yours for even less is this Acer Aspire variant, one of the more powerful of Acer's popular range and designed for more demanding uses, including games. The CPU is a 2.6GHz Intel Core i7-4720HQ, and it has 8GB RAM and an Nvidia Geforce GTX 960M GPU. There's a 1TB hybrid HDD for storage, too.

It isn't as powerful as some other gaming laptops here, but it still packs enough punch to compete. It's also got a quality 17.3" screen, which is one of the larger sizes you'll, and a definite bonus .

Model: Asus G551JM
Price: £850

Asus' Republic of Gamers range of PC hardware has become a favourite of many serious gamers, and this extends to its series of gaming laptops. This range includes some very powerful, and very expensive models, but we wanted to focus on the cheaper end for budget buyers, so we have this Intel Core i7-4710HQ 2.5GHz model. It features 8GB RAM, Nvidia Geforce GTX860M 2GB GPU, and 750GB HDD.

It's a slick unit with a design that looks just as good as the more expensive models, and for it's class as a cheaper model, it's very capable. It performs well in both gaming and benchmarks, and the lower price means you'll save money for some actual games to play on it, which I always good.

Model: 2015 Razer Blade
Price: £2,500

Noted by some to be one of the only truly thin laptops viable as a gaming machine, the Razer Blade is not only a looker, but a very strong performer. It comes at a cost, of course, but this is a truly remarkable system.

It's core is an Intel i7 4720HQ 3.6GHz CPU with 16GB RAM and an Nvidia GTX 970M 3GB GPU. The screen is full HD, of course, and the overall build quality it just superb. What's more, the battery should actually last over three hours in full flight, much more than most similar laptops, and the whole thing is very light considering the power it contains.

It's expensive, but this is one laptop that lives up to the price in pretty much every way, from build quality to specification. Highly recommended.

▲ *2015 Razer Blade 14*

Alienware 18

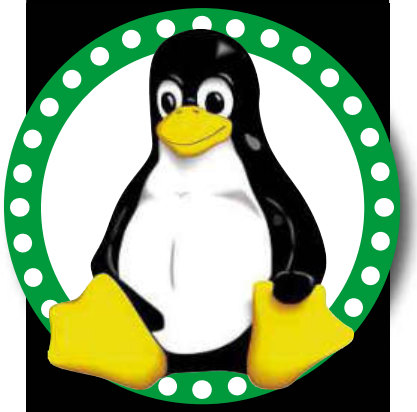
Model: Alienware 18
Price: £4,200
Love it or loathe it, the Alienware range is one of the most prestigious gaming series around, and here we're looking at the Ferrari of its laptop line. It's a true beast, with an overclocked Intel i7-4930MX 4.3GHz CPU (claimed by Alienware to be the fastest mobile CPU you'll find anywhere), and two 4GB Nvidia Geforce GTX780M GPUs in SLI. On top of that impressive base, there sits 16GB RAM and a 256GB Samsung 840 Pro SSD with a 750GB 7200RPM HDD. The display is an impressive 18.4" WLED full HD screen, and the whole thing comes in a futuristic chassis.

Although some of the components individually may not match the performance of some of our other examples, the build of the Alienware 18 makes up for it and the performance really does hit the mark. There's little chance that this is capable of silencing the Alienware haters out there, but for those who want a high power laptop without fuss, or who want a unique-looking system, this is a great option.

Model: Lenovo IdeaPad Y500
Price: £650
We'll finish with our cheapest model, and one that's perfect for entry-level laptop gamers. This is the Lenovo IdeaPad. It's a sub-£700 unit that comes with a an Intel Core i7-720HQ 2.6GHz CPU, 16GB Ram and an Nvidia Geforce GT650 2GB. Storage is decent, with a 1TB HDD, and a perfectly decent 15.6" full HD display to show it all of with.

A particularly interesting feature of the Lenovo IdeaPad Y500 is the modular upgrade bay. This so-called 'Ultrabay' can be used with a selection of optional upgrades depending on your needs; these can be things such as an optical drive, a second hard disk or even a second GPU if you want to boost the Y500s gaming potential even more. Whatever you go for, it's a feature that can be used to turn an otherwise modest system into a much more powerful model, and it's a great idea – especially in a system with this relatively low price. **mm**

Lenovo IdeaPad Y500



Getting Sparky

SparkyLinux GameOver Edition 4.0 gets some attention this week

David Hayward has been using Linux since Red Hat 2.0 in schools, businesses and at home, which either makes him very knowledgeable or a glutton for extreme punishment

Gaming on Linux is nothing new. We've droned on for years in Micro Mart about how good a platform a Linux machine is for games, despite the (still) lack of triple-A titles.

Steam of course has made things a little more interesting on the Linux gaming front, and a wealth of developers are now taking the platform more seriously than they did a few years ago.

Aside from all that, there are also a vast number of Linux-only titles available, and there are a number of game specific distributions available as well. One of them is SparkyLinux 4.0 GameOver Edition.

SparkyLinux GameOver uses a basic LXDE approach that's quick to boot and fast to use. The result is a desktop that uses minimal system resources, so there's plenty left for the games you plan to run on it.

The top of the desktop houses a panel dedicated to the games that come pre-installed with the 3.7GB image, along with a Conky readout displaying the CPU, time and a few other basics on the right-hand side. The bottom of the desktop has the regular LXDE panel, with menu button and connectivity and notification areas.

There are also links to the install client, Steam and Desura, and Wine is included for any Windows titles that can actually run; the same goes for PlayOnLinux as well. For some extra old school gaming, the developer has decided to bundle a copy of MAME, DOSBox, DeSmuME, Stella (Atari 2600 emulator), PCSX-Reloaded and a number of other emulators including some game ROMs to help get you up and running. All in all, it's not a bad selection, and retro gaming enthusiasts will no doubt be perfectly happy spending several hours going through the available titles.

The true Linux gaming titles include: *0 A.D.*, *3D Chess*, *Airstrike*, *Alien Blaster*, *Maelstrom*, *Robots*, *Scorched 3D*, *Warzone 2100*, *Tux Racer* and many more.

> **"Retro gaming enthusiasts will no doubt be perfectly happy"**

What Else?

Beyond the gaming side of things, we have VLC, Radiotray, Dropbox client, Iceweasel, Pidgin, Transmission and several other additions.

But since the emphasis here is on gaming, we don't see any signs of LibreOffice or any other productivity. Naturally, though, they're not too difficult to install.

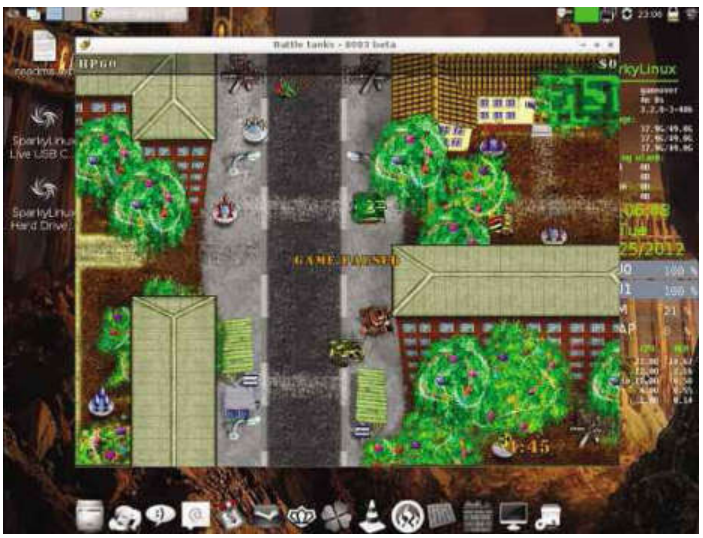
Conclusion

SparkyLinux may not be everyone's first choice of distro when it comes to gaming, but for the sake of an easy-to-use and quick desktop it's not that bad.

The retro side of things greatly appealed to me more than the dedicated Linux gaming side of things, but then these are all programs that can be installed onto an already established system.

Fair enough, SparkyLinux doesn't necessarily offer anything new to the distro table, but if you fancy something different and you've not tried SparkyLinux yet, then it's certainly worth a go at least.

Lots of Linux gaming here, with a good choice of retro emulation



Dust Up

Craig Grannell mulls on the future of his iMac, which doesn't look long for this world

My iMac isn't new. I bought it at the tail end of 2010, whereupon Apple for some reason shipped me one that looked like it had been designed by Jony Ive's rather less capable cousin. The bits didn't connect terribly well. The black screen surround was on at a funny angle, so you could see inside the machine a bit. Apple duly replaced the iMac and got me a new one in time for the holidays. Santa couldn't really compete that year, although heroically stopped short of angrily flinging reindeer droppings down our chimney.

Four and a half years on, and the iMac has, for the most part, fared quite well. I upgraded the RAM and had someone replace the hard drive with an SSD, resulting in a quiet, reasonably reliable machine – at least when OS X is behaving.

It's also perfectly adequate for the work I tend to do these days, which is mostly writing. I have a 27" display and can happily tap away in front of Scrivener and Byword. If I need to review anything, a newer Mac Mini lurks on the desk, ready to spring into action at a moment's notice. It has its own aging Apple display connected to it, but via the magic of target display mode, I can instead plug the Mac Mini directly into the iMac, combining the latter's display and the former's power.

Naturally, the only thing to mess up this perfectly agreeable situation is the iMac's display going wrong, and that's what's starting to happen now. There's no banding or shadowing yet – both issues known to happen with iMacs of this vintage. Instead, the problem is far more mundane: dust. At the time of writing, I'm noticing more and more little grey dots 'behind' the display. This isn't dead pixels, because they move independently of whatever's being displayed.

Unfortunately, this means there are really only two possibilities for what's going on. The first is that there's grime behind the glass that sits in front of the LCD. That is fixable, by carefully taking off the iMac's glass, cleaning it and putting it back again. The second – and, according to a Mac fixer-upper I know, more likely – scenario is that the dust is actually inside of the panel. Should that be the case, I can either ignore it, buy a new panel or buy a new Mac.

At nearly five years old, there's not much point in getting this iMac repaired. A new panel would cost something in the region of 700 quid, and even an argument in an Apple Store, me armed with a printout of the Sale of Goods Act, isn't likely to nudge that figure downwards significantly. But also I don't really want to buy a new Mac. First, I don't need the extra power of a new machine. Secondly, I don't really want to be spending that kind of money right now. And thirdly, target display mode does not exist on Retina Macs (which also happen to cost a fortune), scuppering any future cooperation between my test Mac and main works machine.

In the long run, of course, I'll have no choice but to buy something new. This iMac won't go on forever, and it's already older in years than any other Mac I've owned before it's ultimately ended up on eBay. In the meantime, I'll take my chances with a couple of suction cups, a lint-free cloth and hope for the best. Here's hoping my next Mac Mart column isn't about my fundraiser for somehow having dropped my iMac down a flight of stairs while attempting to wipe away a particularly stubborn piece of dust.

New Retina iMacs are all very nice, but also very expensive, and lack target display mode

Craig Grannell is a writer, designer, occasional musician and permanent loudmouth. He's owned Macs since 1996, when Apple was facing certain doom, and is therefore pleasantly surprised by its current success. Find **Craig** on Twitter at **@craiggrannell**

Clive Alive!

Ian McGurren dives into a world of Spectrum on the go

Ian is a professional IT analyst, a semi-professional writer and a pretty amateur electronic musician. He likes gadgetry and loves making gadgets do things they were never designed to do

Technology these days isn't often thought of as a very British thing, even though the world's biggest selling mobile devices have the technology of British company ARM at their core. But we've always been there, sometimes at the forefront – like with ARM – and other times just doing it our own unique British way. The 'home micro' era of the early 1980s was a superb example of where our Heath-Robinson style collided headlong with the coming information technology revolution. All sorts of bizarre hardware popped up, from Wales' premiere home computer, the Dragon 32, to the Jupiter Ace, a device that eschewed the traditional BASIC programming language for, er, FORTH. Few flourished, bar the Acorn BBC series (a direct linage to ARM there) and, more famously, the Sinclair ZX Spectrum, the British home computer that took on the big US names, like Commodore, and arguably won.

Now the Spectrum is back in the headlines with the release of the Indiegogo-led ZX Spectrum Vega project – officially backed by father of dead fleshed-laden boxes, Sir Clive Sinclair himself. Essentially a Spectrum flavoured version of that past Christmas favourite, the all-in-one plug into the TV box, it's reignited interest in the Spectrum and its legacy of many, many, many games. But what if you don't fancy splashing £100 to see *Pyjamarama* writ large on 4K OLED? Well, you can always indulge your childhood dreams right on your phone or tablet, for much, much less.

Android

If there's a platform that emulation favours, it's definitely Android, with the Play store's more open approach, access to the file system and the bonus of USB. Find a good emulator, load up a micro-SD card with game images, plug in a USB joypad, and you're away. Of course, you'll need a good emulator, and where better to start than for free.

Marvin is a straightforward ZX Spectrum emulator that'll let you play games using a virtual on-screen keyboard or joystick. What's also very helpful is that it links directly into the World of Spectrum games database, so that's thousands of games at your beck and call.

Alternatively there's the fuller featured Spectaculator, which adds officially licensed games packs from the likes of Gremlin Graphics, Odin Computer Graphics and Ultimate, plus controller support (including Bluetooth keyboards), cloud saves across devices, poke hacks and much more.

iOS

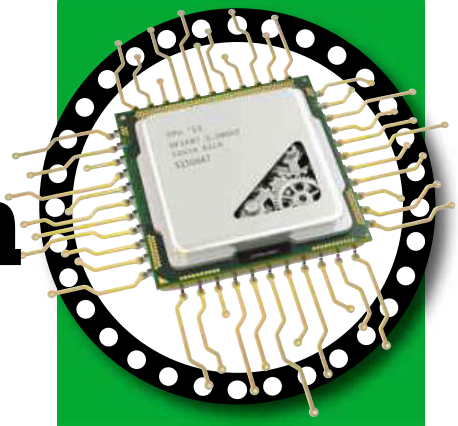
While iOS is a much more closed platform than Android, you can still get your emulation kicks.

Spectaculator actually came out on iOS first and may account for its greater adherence to the use of officially licensed software. It's the best currently available, has all the same features, though you have to rely on the in-app purchases to get additional games. This is fine if you just want an easy, legal way to get games. But if the game you want isn't among those, then it's tough luck.

Alternatively, if your iOS device is jailbroken, there's iZX. Closer to Marvin than Spectaculator, it offers the kind of features you'd want in an emulator that Apple frowns upon, most notably game files. It's also free of charge and available via Cydia.

Retro gaming can be a bit like a Chinese take-away meal: very enticing and nice at first, but a bit bland and uninteresting afterwards. So instead of spending £100 to find out that some of your favourite games of the past haven't aged so well, maybe test the water with your phone or tablet.

Smarter Than The Average Bath



As someone who is regularly outwitted by a kissing gate, Andrew Unsworth finally accepts that in the near future even his thermostat will beat him at snap

Steve Coogan is fantastic, whether he's tupping students as Paul Calf, insulting guests as Alan Partridge or suppressing rage as Tommy Saxondale, but one Steve Coogan project that's sadly underrated is *Dr Terrible's House of Horrible*. The series is comprised of parodies that lovingly poke fun at classic British horror, and it's well worth watching.

I mention *Dr Terrible's House of Horrible* because one of the episodes stars Alexander Armstrong as what would have been called a yuppie if the media had bothered to coin the term in the 1970s, the decade in which the episode is set, rather than the 1980s, one of the many decades in which it isn't. If my memory serves me well, which it probably won't, as getting accurate recall is always a bit of a lottery these days, but if it does serve me well then Armstrong's character lives in a fancy flat that can be controlled by a handset. Armstrong's character can use the remote control to open curtains, change the brightness of lights and do all the other mundane tasks that people would gladly delegate to a robot, just so they spend a few more seconds lazing on the couch.

I mention the paragraph above in response to the paragraph before that because I was recently sent a press release about a new smart-home system, and it reminded me of that episode of *Dr Terrible's House of Horrible*. The reason being that smart-home systems have always struck me as being a bit naff and something of a solution to a problem that doesn't exist. Even central heating systems that are presumably 'dumb' can be programmed to heat your water and radiators at a specific time and switch off at a specific time. Is it really necessary to install a system that'll let you switch on your heating when you're leaving work for your increasingly erudite homestead? Is the novelty of controlling your home's lighting with a mobile phone really that much of an incentive for a bit of 21st century DIY?

As someone who's into technology, I should be cheerleading this gadgetry, but instead I've often dismissed it as nothing more than a fad for the feckless and a waste of time and money. I've spent the best part of a decade convincing people that their lives would be so much better if they networked all their entertainment devices together, yet the prospect of making my fridge a bit colder without having to open the door doesn't fill me with the same giddy sense of excitement. I'm wrong, of course. I'm sure there's more to smart-home technology than I realise (there must be if big-name manufacturers are trying to sell us this stuff), and I'm going to find out more about it. Better still, you're coming along with me, as I'll be writing about smart-home tech in this very column over the next couple of weeks.

Andrew Unsworth has been writing about technology for several years, he's handy with a spanner, and his handshaking skills are second to none

Ryan Lambie has loved videogames since he first stared up in awe at a *Galaxian* arcade cabinet in his local chip shop. 28 years on, Ryan writes about gaming for Micro Mart. He's still addicted to chips and still useless at *Galaxian*

Interstellar

From the creator of Europa Universalis comes Stellaris, a strategy game with an entire procedurally generated universe to conquer

This week, Ryan checks out the new space strategy game from the maker of Europa Universalis and takes a look at a potentially incredible survival game with an ecological twist...

Plug & Play

If you're into your strategy games, you'll already have heard of Paradox. The Swedish studio behind such mind-expanding genre entries as *Europa Universalis* and *Crusader Kings*, it's been honing its craft for the past 20 years but, while its early games featured earthly battles featuring swords and chainmail, its next game reaches for the stars.

Announced at Gamescom, *Stellaris* is described as "grand strategy on a universal stage." According to Pardox, the game will take place among vast, procedurally generated galaxies, where the species we'll encounter will also be randomly generated. Some are peaceful and will become your allies, while others will be warlike and want to wipe out your fledgling civilisation. How you respond to their presence will, like Paradox's other games, depend on whether you're feeling diplomatic or in the mood for a fight yourself.

Like Paradox's other games from the past few years, *Stellaris* will run on the studio's proprietary Clausewitz Engine, which made its debut back in 2007 with *Europa Universalis III*. What Pardox is doing with that technology, however, promises to be rather different. The game will mix "modern real-time exploration with classical strategy", the studio says, with your civilisation developing along three distinct lines – physics, engineering and society. At the same time, other civilisations elsewhere in the universe will also be evolving and growing, meaning that no two games will be exactly alike.

Inevitably, you're going to get into a battle sooner or later, and *Stellaris* will again follow the studio's earlier titles: once a battle's begun, you won't have any control over the outcome, so it's vital that the requisite time is spent on engineering the best armada of ships you can. Forming allegiances with other planets will be vital, too – if a hostile alien force starts hovering around your solar system, it's always wise to have some friends who can help ward off the threat.

Currently in its alpha stage of development, *Stellaris* is still being kept largely under wraps, but what we've seen and heard so far already looks highly

The Dark Patch Rises

While the console version of *Batman: Arkham Knight* was glowingly received among console owners, PC users regrettably had to put up with a port so broken that Warner Bros. Interactive had to hurriedly remove it from sale. Since then, Rocksteady has been somewhat vague about when we'll see a fix for its final *Batman* game, but over the past few days, the studio's revealed that a patch is currently "in testing". Its release is loosely scheduled for "the next few weeks". Warner had originally expected the fix to be ready in August. Will the game be fixed for a relaunch before Christmas? We'll keep you posted.

➤ ***Almost three months after release, Batman: Arkham Knight is still broken on PC. Warner says a patch will be available in "the next few weeks..."***

The world is yours, but how will you look after it? Strangeloop's multiplayer game Eco is not just about individual player survival, but about protecting an entire planet

promising. Paradox's earlier games were huge in scope, but *Stellaris*, with its universe of emerging and crumbling civilisations, looks like its most ambitious undertaking yet. You can see more for yourself at **www.stellarisgame.com**.

Online

Initially, *Eco* looks like just another clone of *Minecraft*. From a first-person perspective, you roam a blocky, leafy world of flora, hills and water, build houses, hunt for food and chop down trees. It's only when you start to read what developer Strangeloop Games has in mind for its survival game that you realise just how much thought has gone into it.

Eco takes place in a simulated world where everything you do to survive will have some sort of impact on the environment. Chopping down too many trees can result in deforestation. Hunting one species too much can end with its extinction. Mining can create pollution, which will poison the waters and cause more creatures to die. Simply put, playing *Eco* isn't just about your own survival, but the survival of the planet too.

"In the extreme," Strangeloop tells us, "the food supply of the ecosystem can be destroyed, along with all human life on it, resulting in server-wide perma-death. *Eco* is a game where the player's actions have meaningful consequences."

So how do players avoid such a disaster? By working together. With potentially hundreds of players occupying one persistent world, they'll have to make careful decisions as to what they build, what animals they hunt and when, and, most intriguingly, what laws to impose and what to do when those laws are broken.

It's an evocative, fascinating premise, and it's little surprise that, at the time of writing, the game's already well on the way to amassing the $100,000 minimum goal it's looking for on Kickstarter. With that funding, Strangeloop plans to add more animal species with improved AI, more buildings and, most worryingly, a series of end-of-world scenarios.

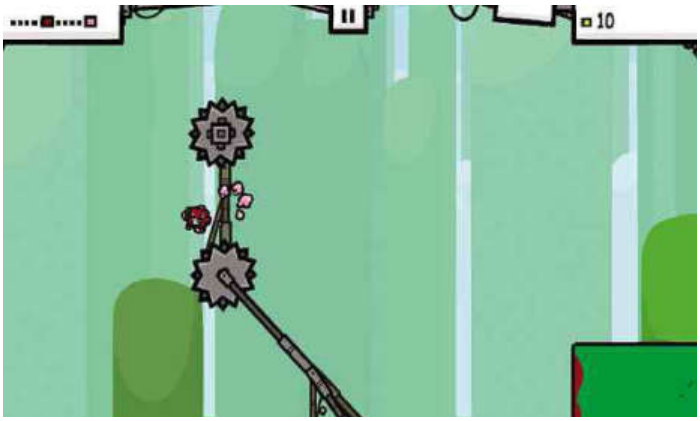
Yes, pollution and deforestation aren't the only threats to your planet in *Eco*. If players wish, they'll be able to choose a *SimCity*-like natural disaster from a pull-down menu, which range from meteors to droughts to global warming. These scenarios will give players an initial challenge to counter: if they're to survive a drought, they'll have to make sure they have plenty of food and water to survive. If a meteor threatens the planet, they'll be forced to develop some futuristic technology to destroy it.

Eco's beta phase isn't due to arrive until April 2016, but the game already looks like a remarkable piece of work. If the finished product can deliver on all the concepts Strangeloop has in mind, *Eco* could prove to be an endlessly absorbing game. The Kickstarter pitch can be found at **kck.st/1gPL7gF**

Incoming

If you're into platformers, you've probably sworn at *Super Meat Boy* a few times. Released five years ago, it was an indie hit for creators Ed McMillen and Tommy Refenes, leading to the inevitable question: where's the sequel? While *Super Meat Boy Forever* isn't a sequel as such, it looks as though it has plenty to offer. Unlike it predecessor's self-contained, trap-filled levels, Forever takes place over a constantly scrolling play area which changes every time you die. It might sound worryingly like just another infinite runner, but Team Meat assures us that it'll offer more than that.

Having been on hold for a little while, *Super Meat Boy Forever* is now in development again, and currently pencilled in for release later this year. Until then, Ed McMillen's new, solo venture *Fingered* – a very weird-looking crime solving game – is available now on Steam.



While it isn't exactly Super Meat Boy 2, Super Meat Boy Forever promises to be another fun – and infuriatingly difficult – indie platformer

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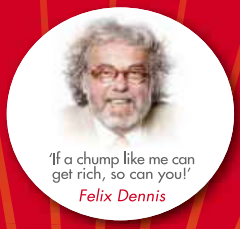

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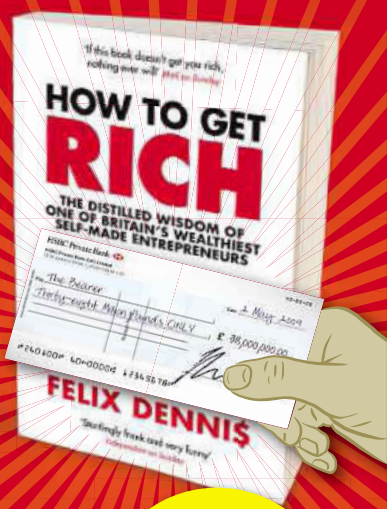

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IBM/LENOVO SFF BASEUNIT. P4/ 2.8 H-T, 2GB RAM, 40GB Hard Drive, CD-Rom, 10/100 Network, sound, USB, Clean install XP-pro, fully updated, Office Suite, Anti-Virus, & all usual utilities, COA Licence Sticker & Install media, £25
Tel: Pat (07710) 348638
Email: pat4cars@aol.com

FUJITSU-SIEMENS MINITOWER. Pentium D 2.8 Dual-Core, 2GB RAM, 80GB Hard Drive, DVD-RW, Gigabit network, sound, Clean Install XP-pro, fully updated, Office suite, Anti-Virus & all usual Utilities, Legal COA sticker & System Image. £35
Tel: Pat (07710) 348638
Email: pat4cars@aol.com

DELL OPTIPLEX GX240 SFF. P4/1.6, 20GB hard Drive, 768MB RAM, CD-Rom, 10/100 network, Sound, Front USB, Clean install XP-pro, fully updated, works OK but slow by modern standards, £15.
Tel: Pat (07710) 348638
Email: pat4cars@aol.com

56kb Fax Modem External. £10.
Tel: Gordon (01314) 660205
E-mail: scobieg09@gmail.com

LG Flatron W2246S 22" monitor with power and VGA leads. No dead pixels in very good condition. £50 Buyer Collects (Verwood, Dorset)
Tel: (01202) 826057 Email: geoffandcynth@themailspot.com

2x 1GB PC2100-648. These two matched sticks were removed from one of my redundant systems. Plus one PC2700 (DDR 333Mhz) and one 512Mb PC3200 DDR400 stick. All for £5 plus £2 P&P.
Tel: Alan (02084) 202322
Email: alan@asandco.co.uk

Very rare Viking IBM 16MB Dram Card (15109 66G5109) for Compaq, IBM Thinkpad, Etc Laptop Only £20
Tel: Gordon (01314) 660205
E-mail: scobieg09@gmail.com

TP-Link 54Mbps 4-port Wireless G Router. Perfect, boxed. Model: TL-WR340G. £20 plus postage.
Tel: Gordon (01314) 660205
E-mail: scobieg09@gmail.com

Intel Core 2 Duo E4600 3GHz 775 Socket Processor. Tested and removed from a working environment. £10 inc Free Courier. Payment via PayPal.
Email: info@jmcomputing.info

Addon Wireless LAN USB 2.0 54Mbps 802.11g Adaptor. Boxed w/ manual and software: £9.
Tel: Gordon (01314) 660205
E-mail: scobieg09@gmail.com

CD Stomper CD/DVD Labelling System: Software, Labels and Label Applicator. Boxed. Unused. £9.
Tel: Gordon (01314) 660205
E-mail: scobieg09@gmail.com

DIR-615 Wireless N Router. Boxed, brand new. £30.
Tel: Gordon (01314) 660205
E-mail: scobieg09@gmail.com

Laptop DDR2 memory sale. 2 Corsair Value Select 533mhz 1GB £18 pair, 2 Hynix 800mhz 2GB £26 pair, 2 Generic 533mhz 1GB £15 pair,1 Generic 800mhz 1GB £10,1 Nanua 666mhz 1GB £, 1 Samsung 666mhz 1GB £8. Postage included
Tel: Jeremy Gill (02089) 430683
Email: arthur.pewty1@virgin.net

2x 120GB Maxtor DiamondPlus 9 Drives plus 1x 80GB DiamondPlus 10. Can be supplied with 2x plug-in caddies. Reasonable offers please.
Tel: Alan (02084) 202322
Email: alan@asandco.co.uk

HP Elitebook 8760w i7 2820QM @ 2.2GHz 32GB RAM 750GB HDD Quadro 4000M GPU. Only 2 small marks on whole machine. Cost £3500 when new. £900 ONO
Tel: (07772) 926632
Email: stedaley19@gmail.com

WD 2TB desktop HDD. Formatted ready for an OS. Runs very nicely. New laptop means desktop items must go! £40 inc. tracked postage.
Tel: (01619) 501218
Email: jmbest2@sky.com

Toshiba C500D-B-11 laptop. Almost new cost £279 will accept *£150ono*
Tel: (01217) 535324

Intel 3930K processor. Used, but not overclocked. No box or fan. £220 ono. Will ship to UK address.
Tel: Tim (01623) 624509
Email tim.stirland@btinternet.com.

Amstrad PcW 9256 in good working order with software. Offers.
Tel: John Adams (02088) 641202
Email: meeching@uwclub.net

Asus P8Z68-v LX socket 1155 motherboard. Original box 1/0 cover user guide driver disk fitted core i3 2100 CPU 3-1GHz and 8GB PC1300 memory. No fan. Working fast and fine. £125 + free postage.
Tel: (01619) 501218
Email: jmbest2@sky.com

HARDWARE WANTED

Trying to breathe life back into an old machine? Why not submit a wanted ad and see if any of the thousands of computer enthusiasts who read the magazine each week have what you're looking for?

WANTED: PC Tower case (beige colour if possible) to rehome an Amiga A1200 vintage computer. The Amiga motherboard is H 410mm x L 190mm (H 16" x L 7.5"). PSU not an issue but if available 250 watt more than enough.
Tel: Bill (07742) 061569 or (02641) 769503.

WANTED: Fractal Design Define XL full tower case. R1 (original version) in black.
Tel: (01670) 860146
Email: mm@tectron.co.uk

WANTED: Working Dot Matrix Printer in Good Condition. Thanks!
Email: printer.20.odaily@spamgourmet.com

WANTED: Acorn computer either an A5000 or A7000. Also book on teaching yourself binary.
Tel: (07817) 861011
Email: Johnhaviland73@gmail.com

SOFTWARE FOR SALE

Do you have old software that you simply don't use? Why not advertise with us and see if anyone else can make use of it – you may well be surprised to find that someone is looking for it!

Adobe Photoshop Elements and Premiere Elements 12 Full Version - Windows/Mac. Original Boxed CD with unused product key. £47.50
Tel: Ian (01932) 856971
Email: a2345@btinternet.com

PCB design software 127 layers, schematic entry, PCB entry, PCB to Gerber file converter, output to printer. £9.99
Tel: Nigel Wright (07967) 527693
Email: cresswellavenue@talktalk.net

Cyberlink PowerDVD 12 Standard. Runs under Windows 8, 7, Vista or XP. Original CD with unused product key £7.50
Tel: Ian (01932) 856971
Email: a2345@btinternet.com

Microsoft Office 2013. Original Software only £100.
Tel: Gordon (01314) 660205
E-mail: scobieg09@gmail.com

Sim City 2000. Boxed and original. Classic gaming. £15.
Tel: Gordon (01314) 660205
E-mail: scobieg09@gmail.com

Norton Family Premier 2.0. Runs under Windows 8, 7, Vista or XP, Original Symantec unused product key £15.
Tel: Ian (01932) 856971
Email: a2345@btinternet.com

Nuance Omnipage 18. OCR for Windows 8, 7, Vista or XP, Original CD with unused product key £25.
Tel: Ian (01932) 856971
Email: a2345@btinternet.com

Acronis True Image Home 2012. Bootable CD. Application runs under Windows 8, 7, Vista or XP. Original Acronis CD with unused product key £5.
Tel: Ian (01932) 856971
Email: a2345@btinternet.com

SOFTWARE WANTED

Wanted: PictureToExe software, for making picture shows.
Tel: (01202) 610602
Email: ivor.mary@talktalk.net

Wanted: Quicken 2001.
I desperately require a copy of QUICKEN 2001, UK Edition. I need to reinstall the program, but have lost my original installation CD.
Email: david.maddams@icloud.com

IMPORTANT BUYING ADVICE

We work very hard to police our classified ads, and make them as secure as possible. However, please do your bit too and use the following guidelines:

• **Never - NEVER -** pay by bank transfer or post out cash, unless you know the trader already, or are sure it is okay to do so. Pay by cheque, Paypal, Nochex etc wherever possible.

• Be wary of anyone who insists on you paying by the above methods if in doubt, get us to check them out by mailing editorial@micromart.co.uk

• Keep copies of all correspondence

• When sending out goods, at the least obtain a certificate of posting from the Post Office

If you are in any doubt, feel free to send us a mail via editorial@micromart.co.uk.

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30 Cleveland Street
London
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Contact Aaron by email at:
aaron@micromart.co.uk

Please try to keep your queries brief and limit them to just one question per letter, simply so we can squeeze in as many as we can each week. Please include relevant technical information too.

Aaron

Hide GWX

I see that Windows 10 is now rolling out to users. Like others, I'm now greeted by the new Windows icon that allows me to upgrade for free. That's great, except I don't want to. I'm quite happy with Windows 8 and have no intention of upgrading any time soon. I just don't want the possible hassle of program not working, and having to update everything again.

So, I'd simply like to be able to remove this icon, or at least hide it. The latter would be more useful, I guess, just in case I decide to make the jump at some point. Cheers.

Jeff

The easiest way to hide the GWX (Get Windows 10) icon is to right-click on the task bar clock and select Customize Notification Icons. In the list you'll find the GWX icon. Under Behaviours select the option to hide the icon and notifications and click OK. That'll keep the option to upgrade, but hide it until you want to use it. To restore it, simply repeat the process, but select to show the icon.

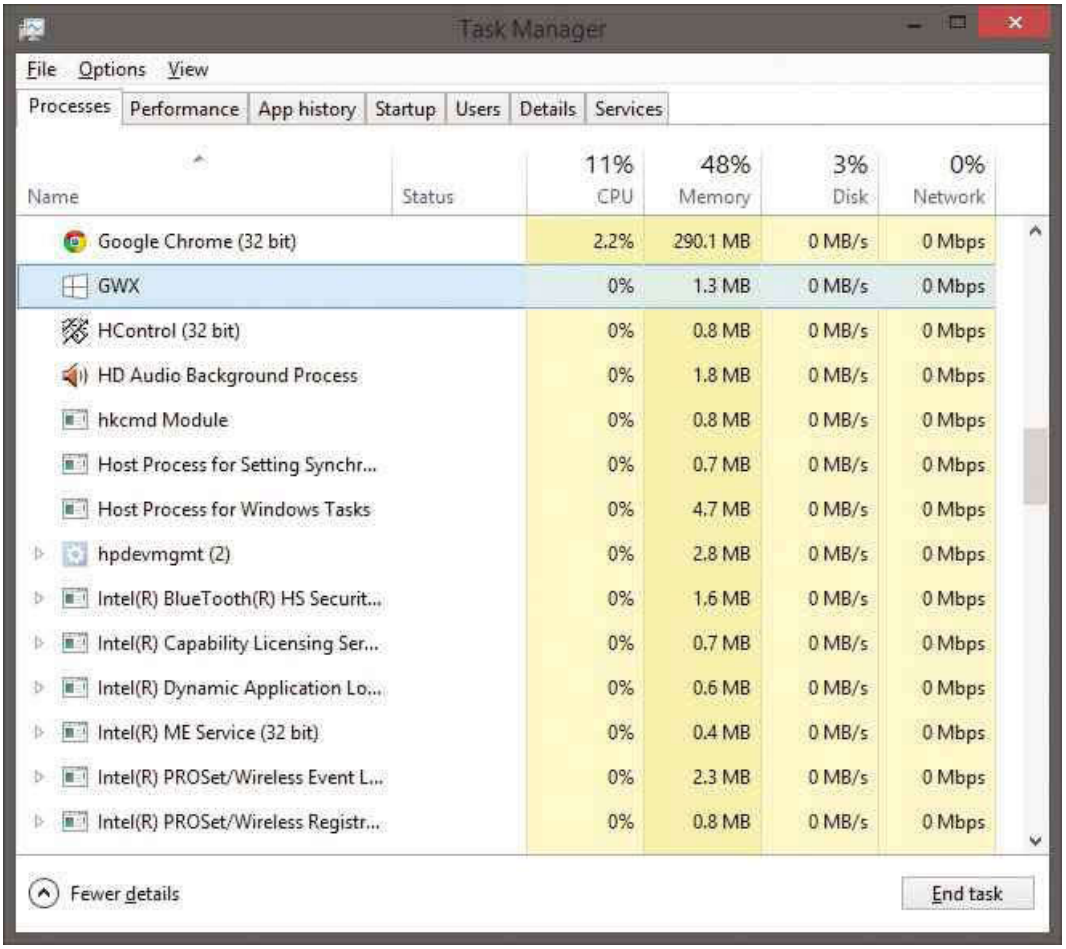
If you want to take a more drastic step and remove the GWX feature, there are a couple of popular ways. First we'll try deleting the files the upgrade uses. To do this, open Task Manager (CTRL+ALT+DEL) and locate the GWX process. End it, and then head to C:\Windows\System32\GWX (or C:\Windows\SysWOW64\GWX for 64-bit installs), and delete the GWX folder entirely.

Another approach is to remove the Windows Update that's responsible for the GWX icon. To do this you'll also need to set your Windows Update to manual so it asks you what to download and install, otherwise the removed updates will simply be reinstalled again. So, to begin, head to Control Panel and then go into Windows Update. Click the Change Settings option to the left, and under Important Updates, pick the option 'Check for updates but let me choose whether to download and install them' and click OK and reboot.

Next, go back to Control Panel and then into Programs > Uninstall a program. Click the View Installed Updates option to the left, and in the update list, locate update KB3035583 and uninstall it. This update deals with the GWX app. Once it's removed, you'll no longer have the GWX icon.

Personally, I'd advise simply hiding the GWX icon instead of deleting folders or removing services. It's always best to have the option to upgrade, and hiding it will make it much easier should to change your mind.

If you don't want the GWX icon, it's easy to hide it



USB Drive Stalled

I hope you can help me with a problem I have regarding my USB drive. I have a 16GB USB flash drive that I need to transfer some video files to. I've been getting into video editing, and am currently trying to author a birthday video for family member using footage I captured and transferred to my PC (which runs Windows 8).

I have the files on my PC, and I can work with them with no problems, but when I try to copy them to my USB drive, I'm told the file is too large for the USB drive. This is confusing, as the video file is 5GB, but my USB drive is 16GB, and there's nothing else on it. There's plenty of room, so I just don't understand what the problem is.

As I clearly have enough room, and am only copying one file, I'm just at a loss, and I hope you can help. I really do need to transfer this video as soon as I can. Thanks in advance.

Graham

This is a pretty simple one, so don't worry Graham, we'll get that video copied right away. The issue here is that most USB flash drives are shipped with a file systems formatted as FAT32 as default, even today. FAT32 is an older file system, long since supplanted by NTFS, which is faster and more efficient. The most important difference, however, is the maximum file size: FAT32 file system has a maximum file limit of 4GB, which is why you're getting a message telling you the file won't fit on the drive, even though there's enough room.

To remedy this you need to format the USB flash drive to NTFS or if you prefer, exFAT, both of which have no such file limit (at least none you have to worry about). Simply open up Explorer and right-click the USB flash drive. Select Format, and in the dialog box choose NTFS or exFAT as the file system. Start the format, and let it complete. Once this is done, you'll be able to copy much larger files.

Be aware, however, that a lot of other media equipment, such as set top box media players, smart TVs, and games consoles won't recognise the NTFS file system, as they're only developed for FAT32. So, if you intend to use the flash drive on such hardware, check to see if your hardware will recognise the NTFS file system, or use exFAT, which most media hardware will support. NTFS is more suitable for large data files destined for PC use.

If you need to move files larger than 4GB to a flash drive, you'll need to use the NTFS file system

New AV

I'm thinking of moving to a new antivirus program. Up until now I've used the McAfee application that came with my computer. The subscription I got when I first used the system has since ran out, though, and I'd really rather not renew. I would prefer to use a free program if possible. I've got my sights set on Avast, or possibly AVG, but I have a question.

What's the best way to install my new program? I've heard that I shouldn't have more than one security program installed at one time, but I've also heard how dangerous it is to run without one installed. So, should I install the new program, then remove the old one? This would mean I'm always protected.

I welcome your advice.

Ben

You've heard correctly, at least partially. It's not a good idea to have more than one antivirus program installed, but you can have other security software installed, such as adware scanners and a firewall. In fact, this is advised, as an antivirus program alone can't fully protect your system.

That said, when it comes to the correct method of removing an old AV app and installing a new one, it's best to remove the old application first, then install the new one. You'll be left without protection for a little bit, but not long enough to be a major risk. If you're really worried about it, simply disconnect your PC from the Internet while you do this, and then reconnect afterwards and update your new antivirus immediately to make sure you're properly protected.

As an extra step that will help to make sure McAfee is fully removed from your system, use the official McAfee removal tool before you move to your new app. This will ensure all files and remnants of the program are gone before you install the new application. You can get this from ***bit.ly/1gDSWPT****.*

ASK JASON

Meet Jason D'Allison, a veteran of Micro Mart's panel of experts. He's here to help with any technical questions, including anything to do with tablets or smartphones, as well as PCs

Send your questions to:
Jason D'Allison
Micro Mart
Dennis Publishing
30 Cleveland Street
London
W1T 4JD

Contact Jason by email at:
jason@micromart.co.uk

While we try to cover as many questions as we can, we regret that Jason cannot answer your questions personally, but he'll cover as many as he possibly can each week. Please ask one question per letter and remember to include the full specification of your computer, including its operating system.

Jason

Hover Bovver

Windows 10 has a new feature that I really don't like. It seems I can use the wheel on my mouse to scroll up and down windows that aren't actually active. If I've got Chrome open behind Word, for instance, I can still scroll in it, even though it's an inactive window. Surely only Word, the active window, should be scrollable? Can I switch this feature off? It annoys me.

H. Savage, Nottinghamshire

I think this feature's pretty cool. It's less useful than I'd thought it would be, but it has its moments. Anyway, here's how to disable it. Click Start, click Settings, and choose 'Mouse & touchpad'. You'll see a toggle switch labelled 'Scroll inactive windows when I hover over them'. Move this to Off. Job done.

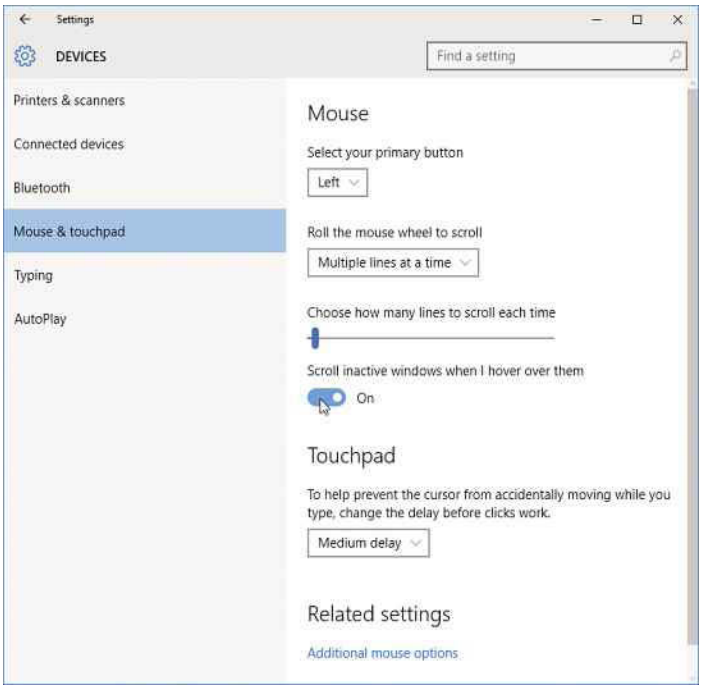
Now, as much as I'm enjoying Windows 10, I simply cannot understand why system options are scattered to the four winds. It was the same with Windows 8.x (which I've never used as a daily driver). Some are in the Settings menu (for 'average' users) and some are in Control Panel (for geeks). For example, both have a section for configuring mouses, each with its own set of options – apart from the ones that are duplicated.*

Madness! Why can't everything be in one place? Why not offer just the Settings menu and have all the geeky stuff tucked away under buttons labelled Advanced? Shockingly bad design, in my view.

** The easiest way to access Control Panel is to right-click the Start button and bring up the hidden 'power user' menu (Windows key + X does the same thing). On a touch device, long-press the Start button.*

"I can't understand why system options are scattered to the four winds"

I like this feature, but am I alone?



Bits And PCs

This week I have been mostly...

... reading that one of my eBay accounts has had most of its usefulness revoked (there's been a vague accusation of wrongdoing, for which there's not a scintilla of evidence – eBay is judge, jury, and executioner, it seems)

... playing on the 2p pushers in the arcades in Torquay (I'm going to win a Minions keyring even if I have to spend £100!)

... watching my business partner repairing an iMac whilst it was still plugged in – he was propelled ten feet backwards (but luckily lived to tell the tale, unlike the iMac's screen, which he dropped in the process)

... listening to *Speed of Light*, the new single from Iron Maiden, which has possibly the coolest video I've seen this century (if you like gaming you'll be in awe – and should definitely give it a go at **goo.gl/d1ebKm**)

... cancelling my phone contract (the two years was up months ago) and switching from T-Mobile to a rolling goodybag on Giffgaff (O2) – at least I can now finally get a signal inside my house!

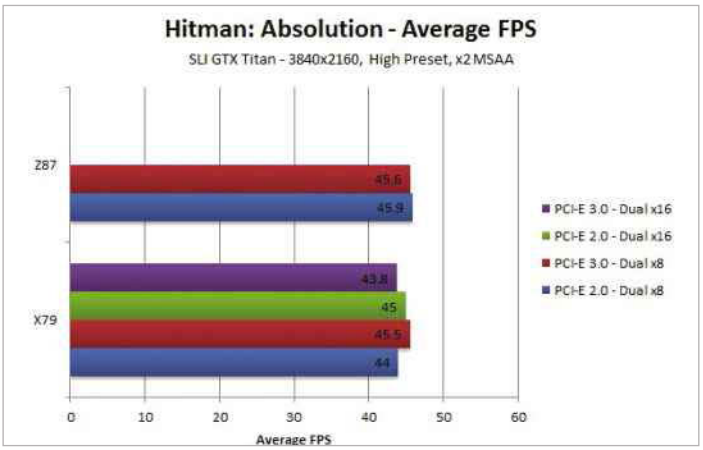
Express Checkout

My GeForce GTX 570 graphics card isn't good enough any more. Newer games are too demanding. I want to upgrade, but all the latest cards are designed for PCI Express 3.0. My Core i5-3570K supports this, but my ASRock Z68 Pro3 only supports PCI Express 2.0. I know modern cards will work, but will there be a bottleneck? Should I buy a new motherboard? For that matter, should I also replace my CPU?

Duncan, Gmail

I'm going to point you to this test at Puget Systems: ***goo.gl/8G1aLH****. The guys there ran a GeForce GTX Titan setup at PCI-E 3.0 ×16, PCI-E 3.0 ×8, PCI-E 2.0 ×16, and PCI-E 2.0 ×8, both with a single card and under two-card SLI. It may surprise you to hear that GPU performance across all tests was virtually identical – even at a resolution of 4K.*

Now, this test was undertaken back in November 2013, and of course the GeForce GTX Titan is no longer the fastest GPU on the block. The GTX 980 Ti, GTX Titan X, Radeon R9 390X, Radeon R9 Fury X, and several others – all are significantly faster. But PCI-E 2.0 ×8 provides only one quarter *of the bandwidth of PCI-E 3.0 ×16, so if that's no bottleneck for the GTX Titan, there's no way PCI-E 2.0 ×16 will be a bottleneck for the likes of the GTX Titan X. There's a chance PCI-E 2.0 might now show its age under SLI or CrossFire – probably only in three- and four-card configurations – but that's not on your radar.*



Does PCI Express 2.0 still cut the mustard? [Image courtesy of www.pugetsystems.com]

Clearly, anyone building a new system should be going with PCI-E 3.0, but anyone with an existing system that's stuck on PCI-E 2.0 needn't feel compelled to upgrade in order to get the best out of modern cards and games. Your Core i5-3570K is also easily good enough. Buy your new graphics card with confidence, Duncan, and put the rest of your money back in your pocket.

Photo Uncopier

I'm not the most organised of people when it comes to my PC. I've started to make backups of my important data, but it's become clear I've got photos here, photos there, photos everywhere – often, it seems, with multiple copies of the same file. Then there's my work documents, music, videos, and all the rest. Before I carry on with the backups, then, can you recommend a utility – preferably free! – that'll scan my hard drive and weed out all the duplicates? I'm running Windows 8.1.

Louise Williams, Outlook.com

Some while back I needed to undertake the same task, Louise, and I spent no small amount of time trying different utilities in order to find the one that suited me best. Quite frankly, many of the utilities were dreadful, but a diamond in the rough was NirSoft's SearchMyFiles. Grab it at ***goo.gl/FXhMSK****. I still use this now, though I confess I've not looked since to see if its crown's been taken by something else. I'd be surprised.*

*By default, SearchMyFiles is a regular file-finder. It goes without saying it's vastly better than Windows' own effort, even Windows 10's. However, I don't think it's quite as fast as Mythicsoft's Agent Ransack (****goo.gl/Cq2J84****), another favourite of mine. By clicking the Search Mode menu, though, you can change SearchMyFiles' behaviour from Standard Search to Duplicates Search.*

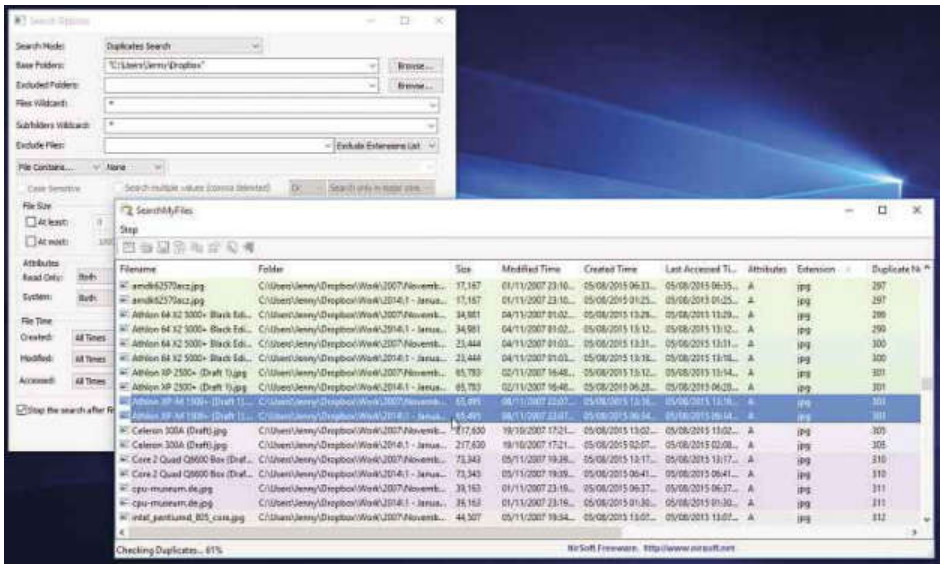
The sheer number of options can be daunting. Don't be put off. Everything's self-explanatory and laid out in a single window, and in most cases you'll just need to browse for a base folder or drive (or multiple base files or drives) and hit Start Search. Unlike most rival programs, SearchMyFiles will let you scan network folders – those on a NAS box, say.

File names are pretty much ignored, which is what you want. For instance, you might have three dozen files with the same name, all with different contents. None of those will appear as duplicates. Conversely, you might have several copies of the same photo (probably without realising), each with a different names. All of those will show up. The program finds duplicates by byte-matching.

In the results window, duplicates are grouped in coloured bands, and any files you want to blitz can be right-clicked and deleted. Hold down Ctrl to select and delete multiple files at once. Leave system files alone, mind. The same file might be needed in more than one location, so deleting all but one instance could land you in all sorts of bother. Only pull the trigger on user-created files.

PS – For readers running Windows 10, I can confirm that SearchMyFiles works fine. So does Agent Ransack, for that matter.

When weeding out duplicate documents, keep your trigger finger off system files!



Crowdfunding Corner

High-end hardware takes the spotlight in this week's Crowdfunding Corner, as we look at a pair of projects that, while not necessarily expensive, are both at the premium end of the spectrum

The Sensel Morph

Reliably sensitive touch interfaces have quickly gone from being a crazy futuristic dream to something we're all familiar with, so it's no surprise that some people are trying to use them in new and different ways. The Sensel Morph is a USB and Bluetooth-compatible attempt to make multi-touch work for desktops the same way it works for tablets.

The first interesting thing is that it's pressure-sensitive rather than capacitive, so you can use your fingers, a stylus, or any other implement. It's sensitive enough to pick out individual strands in a paint brush, which means that as well as standard prodding and swiping interfaces, it can be used for painting and graphics. A selection of magnetic overlays being produced transform it at a stroke into a keyboard, or a piano, or a game controller. There's even a clear overlay case so that you can develop your own.

The project has already almost tripled its $60,000 (£35,000) goal and doesn't end until the start of October, so there's a good chance it's going to have a lot of extra stretch goals to meet between now and then. One unit with three overlays costs backers $249 (£160) and the product is shipping in June 2016. We look forward to seeing how it turns out.

URL: kck.st/1JktNd4
Funding Ends: Friday, October 9th 2015

Nayano Outrider: The Ultimate USB Flash Drive

Flash drives are getting cheaper every day, but that's created a race to the bottom whereby most are now flimsy and built for short-term (or very careful) use. If you want something that'll truly last, though, maybe you need the Nayano Outrider.

Styled as the 'ultimate' USB flash drive, the Nayano Outrider is made of solid metal, so it's incredibly rugged can can't be easily damaged. A built-in keychain with release switch means it's hard to lose but easy to access. The swivel-open design means you don't have to worry about losing its protective cap.

This project is designed to support the drive's development and manufacturing process, so the rewards are fairly modest but still desirable. When it's ready, the drive will be available in standard capacities from 8GB to 64GB, and have a native USB 3.0 connection for high-speed access. At present, backers can support the project in return for an 8GB model, which costs as little as $10 (£6.50) – an estimated 50% off the retail price. Higher tiers allow you to buy multiples of the drive, but at no greater discount, so this is one project where you're in it for supporting the idea as much as what you'll get out of it.

Still, that's sort of what Kickstarter is supposed to be for. They're currently halfway to a $3,000 (£1,900) goal and it seems likely that'll be reached by the end of the campaign.

URL: kck.st/1Lwl0FH
Funding Ends: Sunday, September 20th 2015

Disclaimer: Images shown may be prototypes and Micro Mart does not formally endorse or guarantee any of the projects listed. Back them at your own risk!

App Of The Week

Earth Now

Environmental concerns are the order of the day and Nasa is here to help

Nasa, the National Aeronautics and Space Administration, home of cool astronauts who can play guitars and sing David Bowie songs, the real life StarFleet and that place where important people gather when recruiting Bruce Willis to blow up an earth-bound asteroid, has recently released an update for its Earth Now app, for both Android and iOS.

The Climate App

Earth Now is an app developed by both the Visualisation Technology Application and Development team and the Earth Science Communications team, as well as the rather more famous Jet Propulsion Laboratory. It's an interesting app that can be used to visualise the latest global climate data from the current batch of orbiting earth science satellites and project that data in a series of false colour overlays on the latest mapping technology.

Information such as air temperature, carbon dioxide levels, carbon monoxide levels, ozone, vapour, gravity and sea level variations can be displayed in glorious technicolour and collate themselves onto a 3D spinning model of the earth.

Based on the data that Earth Now receives, a collection of prediction models can be built, so the user could essentially see where the worst cases of climate change are more than likely to happen and where currently the worst offenders of air, sea and land pollution are located.

Interesting Stuff

The amount of information is quite staggering and consequently quite sobering. It's one thing to hear on the news or read about the levels of emissions pumped out by various cities, but it's something else entirely to actually see it in a real graphical representation.

Earth Now is an ideal app for the student of GCSE (or even perhaps A-Level) Environmental Sciences, as each of the aforementioned sections offers an incredible amount of extra detail when viewing the various descriptions of each and when drilling down to further target the sections.

For example, the sea level tracking is a particularly interesting aspect, especially as East Anglia appears to be destined to be underwater in a hundred years' time. Should I survive that long, then a set of gills would certainly come in handy.

Features At A Glance

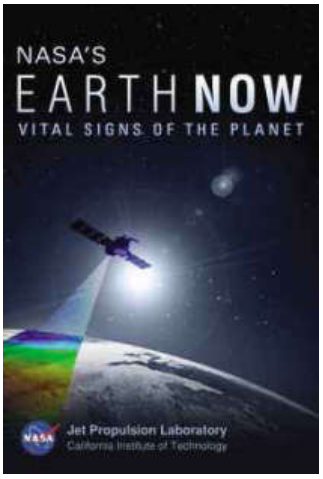
- Free.
- A wealth of satellite and scientific data at hand.
- False colour overlays and updated datasets on top of updated maps.
- Rather thought provoking.

Conclusion

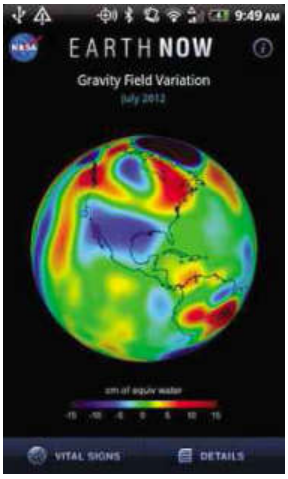
The Earth Now app is a great little learning app. The information contained within is backed up by the current data being fed into the system via the collective power of Nasa and the other bodies, so any referencing can be considered as valid, and the graphical displays are easy enough to comprehend and manipulate into a more readable form if necessary.

The recent update contains many bug fixes and improved stability, as well as improved datasets and some minor alterations in the text when delving into more detailed data.

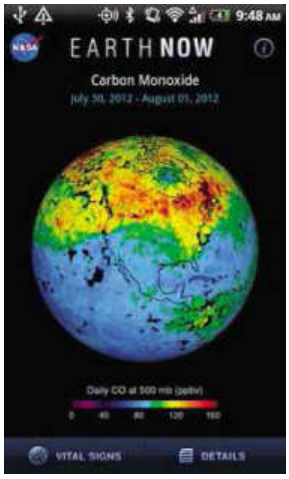
On the whole, Earth Now is a free app that not only makes you consider the potential damage you could be causing, but could inspire the user into making changes that can ultimately prove quite significant to the future of earth – not to mention the future of East Anglia!



Nasa's vital signs of our planet, which isn't looking too healthy



The false colour overlay provides an easily understood dataset



Clearly, the northern hemisphere isn't looking great

Logging Off

Over the past week, I've converted one of my machines to Windows 10, mostly because it had the dreaded Windows 8.1 on it.

I don't use it enough to make a call on whether that's a positive change yet, but it did make me consider the fine balance that these software products are asking customers to make. Specifically, the mining of personal data and the value of that to those companies that can get you to hand it over.

At this time, and I may well have chosen badly, I generally go along with Google and I don't with Microsoft. But with Windows 10, I've already realised that the implications of not rolling over and showing my soft data-rich underbelly could be quite significant.

What points this out is that there are a bunch of applications under Windows 10 that you can't easily uninstall, not without extreme measures that might well break the OS.

These include Mail, Calendar, Cortana and People. There are some others, but I mention these specific ones, because they're critical to the data gathering exercise at the very heart of this platform.

Cortana can only seem intuitive, because your email is parsed, and it knows about your contacts from People and their relationship to you. The overreaching objective of this data flow is to build a model of your life – information that anyone wanting to sell you something would certainly find helpful.

However, and I need to stress this point, Google does exactly the same thing on Android and with Chrome – it's a dance with the devil of sorts. And it's up to you if that devil is Apple, Google, Microsoft or the whole gang.

But the penny that dropped this week for me was I suddenly realised something subtle about this situation that could be rather critical in the future.

If you don't buy into the deal, like I've essentially refused to with Microsoft, then their products seem, er… rubbish. Because I won't use Mail, and I'm even considering a local account access to Windows 10, then Cortana will be entirely stupid, because I'm a blank page to her databases (Bing).

Obviously if I ask Cortana questions, that's data of sorts, and if I use Edge to browse, that's some info too. However, compared to the mass of information that actually submitting to the privacy invasion

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would yield, it's just not the same or even close.

What's fascinating to me is how, starting with Windows 8.x, the OS has moved from being a passive tool to one that's on a data collecting mission, and without success at that job it's a shadow of its full potential.

Similarly, the Apple ecosystem doesn't seem as remotely wonderful if you don't use iTunes or have both an iPhone and an iPad.

On the face of it, that seems a rather polarising strategy, because the company message here is that it want its customers 100% committed to its products or not at all.

That's fine when people are buying into the deal, but potentially a commercial fiasco if they're not.

My disturbing conclusion in respect of Windows 10 is that if you're not prepared to use it the way Microsoft wants, it is probably pointless upgrading to it in the first place. This view might be wrong, but I'm giving some consideration to it.

Mark Pickavance

LAST WEEK'S CROSSWORD

Across: **7** Condition Code, **8** Denial, **9** Phobia, **10** Case Fan, **12** Ad Lib, **14** SMART, **16** Mundane, **19** Stasis, **20** Legacy, **22** Prelinguistic.
Down: **1** Zone, **2** Advice, **3** Stellar, **4** Loops, **5** ICloud, **6** Addition, **11** Armature, **13** Nucleus, **15** Result, **17** Digest, **18** Async, **21** Coil.

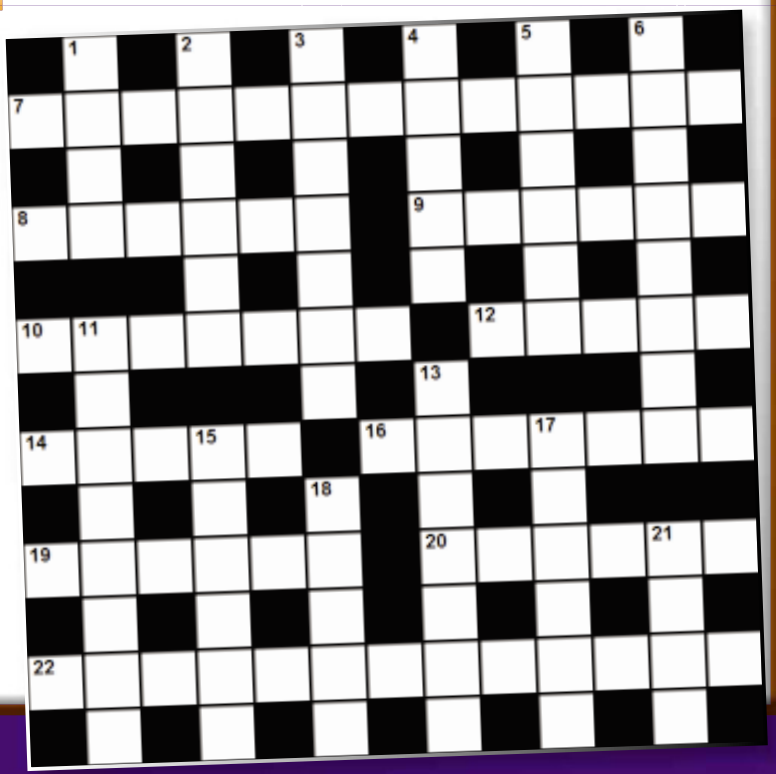
THIS WEEK'S CROSSWORD

Across

7 A four-sided plane rectilinear figure with opposite sides parallel. (13)
8 Generic term for a tabloid newspaper. (6)
9 Make partial or minor changes to something. (6)
10 A collection of standard programs and subroutines that are stored and available for immediate use. (7)
12 A model for structuring object-oriented programs – a template class in C++. (5)
14 Propose an amount you are prepared to pay for something. (5)
16 A digital signal processing device that converts a continuous signal to a discrete signal. (7)
19 Expressing action rather than a state of being. (6)
20 A reference point to aim at. (6)
22 A group of stars forming a recognisable pattern that is traditionally named after its apparent form; often identified with a mythological figure. (13)

Down

1 The period of time to which an artefact or structure belongs. (4)
2 Major US manufacturer of computer hard drives founded in 1982 and acquired by Seagate Technology in 2006. (6)
3 Ready-made pieces of computerised graphic art that can be used to decorate a document. (7)
4 A vitriolic or abusive forum posting, typically one sent in quick response to another message. (5)
5 Boney M's Moroccan retreat. (6)
6 Science fiction first-person shooter video game developed by Valve Corporation. (4-4)
11 Computer implementation of the board games Ataxx and Hexxagon. (8)
13 Designed to be perceived by touch. (7)
15 By (or from) the thing itself – by the same token. (2,4)
17 A bit that is used in an error detection procedure in which a 0 or 1 is added to each group of bits so it will have either an odd number of 1s or an even number of 1s. (6)
18 A device that measures and records the quantity, degree or rate of something. (5)
21 Technology that enables an efficient recording of the sale of goods or services to the customer. (Acronym) (4)



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Lately, we've been discovering our inner Bob the Builder. Well, maybe that's not the most accurate description, but we have been getting our hands dirty with a little bit of DIY, and we have to say that we're really quite proud of our achievements so far. To date, we've changed a bathroom door handle to a bathoom door handle with a lock in it (we only made one mistake, which we 'fixed' with Gripfill); we chipped some old mortar off an external wall; we changed a few plug sockets; we cleaned out some gutters; and we painted a whole load of walls. We probably won't be getting our own home improvement show any time soon, but so far nothing we've fixed has fallen apart, so we're happy. It might not be as natural to us as putting together a PC, but we reckon we're getting the hang of it. Maybe we're getting ahead of ourselves just a tad, but next we think we'll have a go at fixing cars. How hard could it possibly be?

Top 5 Tech Things Kids Of Today Don't Get

They don't know how good they've got it, etc., etc.

1 Teletext Gaming

These days, when you're watching TV, pressing the red button on your remote, even on Freeview, will open up all kinds of wonderful menus and features. You can get weather reports, video services and more, including, yes, games.

But not that long ago, if you wanted to play games using only your TV, then it meant using Teletext, a service that provided text and simple graphics via a television signal. If you're anything like us, you would have wasted many hours of your life playing Bamboozle on Channel 4, a multiple choice quiz that involved answering questions by pressing the coloured buttons on your remote. If you're nothing like us, then you probably had better things to do.

2 Old Text Messaging

People of today are spoilt when it comes to messaging. They can easily send text, photos, sound and even video via apps like WhatsApp and Skype, but 20 years ago, things were much different.

Back then, predictive text was in its infancy, and for most people, sending a short message meant pressing each key several times, cycling through a series of characters until you reached the one you wanted. And, of course, if you were a bit overzealous with your tapping, then you could easily overshoot and go past the letter you required, meaning you'd have to go back round again.

Kids, next time you complain about predictive text on your phone or inaccurate dictation features, just think about how much worse it used to be.

3 Geocities

One of the great things about the internet is that it allows for people to easily share information via personalised websites. However, there's no guarantee those people actually have any design abilities…

Thankfully, services like Blogger and WordPress have plenty of fantastic templates that can be used to knock up a fairly attractive site in minutes, but back in the day, one of the most popular methods of getting a website online was to use Geocities.

We're not sure why, but when people used this service, rather than choosing which fonts they were going to use, they just chose to use them all, as well as dumping tons of clip art all over the place and perhaps even the odd excruciating sound effect.

If you're too young to remember it, count yourself lucky. If you'd like a taste of it, though, head to **www.wonder-tonic.com/geocitiesizer**.

4 Dial-up

With today's superfast broadband connections and high-definition video streaming, it's hard to believe that we ever relied on dial-up internet. Of course, websites weren't so big back then, but even at the time, our connections often seemed slow.

That's not something we miss, because we really didn't enjoy waiting 15 minutes to download one low-quality MP3, but who doesn't get a bit misty-eyed when they recall the screeching and squealing of their 56K modem? It's that mixture of joy and pain that makes dial-up so special.

5 Tape-based Media

It's amazing to think that physical disc-based media is on borrowed time, with many people preferring to stream video and music or to download their content to their computers. It wasn't that long ago, if think about it, that VHS and audio cassette tapes were still popular.

We'd love to see how young people nowadays would cope with this technology, which would no longer allow them to skip chapters or tracks, or go right back to the beginning at the tap of a finger or the click of a mouse. And if they wanted to share the content, rather than clicking the Facebook button, they'd have to eject the tape and then physically hand it over to someone else (remembering to rewind it to the beginning first, of course). Amazing.

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